

Food poisoning in hospitals in Scotland, 1978–87

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SUMMARY

During the 10-year period 1978–87 there were 48 outbreaks of food poisoning in Scottish hospitals affecting a total of 2287 persons of whom 12 died. This compared with 50 outbreaks during the previous 5 years (1973–77) when over 1500 persons and 7 deaths were recorded. Although the incidence of outbreaks has decreased the average number of persons affected in outbreaks has increased. A marked reduction was seen in the incidence of outbreaks due to *Clostridium perfringens*, in contrast to foodborne salmonellosis which remains a problem. Thirty-four hospitals, of which 10 reported two or more outbreaks, were involved. The type of hospitals most frequently affected were general (14), psychiatric (13), geriatric (9) and hospitals for the mentally subnormal (7). Meat, including poultry meat, was incriminated in over 90% of outbreaks where a food vehicle was identified. In modern or re-equipped kitchens cooking in advance with subsequent reheating is being progressively discontinued as more food is being cooked on the day of consumption, a practice which may readily explain the decreasing incidence of outbreaks due to *Cl. perfringens*. Bacterial cross-contamination from poultry-meat and other raw foods, compounded by inadequate temperature control, however, continues to be a problem in some hospitals. It is too early as yet to determine whether the removal of Crown immunity will have any effect on the future incidence of hospital 'food poisoning'.

INTRODUCTION

The last review of food poisoning in Scottish hospitals covered the period 1973–77 during which 50 outbreaks were reported (Sharp, Collier & Gilbert, 1979). Since then hospital-acquired foodborne infection continues to occur with extensive outbreaks of salmonellosis in particular being reported in Scotland (Collier *et al.* 1986) and elsewhere in the United Kingdom (Report, 1986).

This paper reviews the incidence of food poisoning in hospitals in Scotland in the subsequent 10-year period 1978-87, when a further 48 outbreaks affecting 2287 persons of whom 12 died were recorded, and discusses the changes which have taken place in the frequency of the aetiological agents causing foodborne infection, in poultry consumption and in catering practices.

MATERIALS AND METHODS

Outbreaks of foodborne infection in Scotland, inclusive of outbreaks occurring in hospitals, are recorded at the Communicable Diseases (Scotland) Unit, Glasgow. Aetiological, clinical and epidemiological details obtained are based on routine laboratory returns and reports from microbiologists, community medicine specialists and environmental health officers. Additional information relating to sero/phage-typing and toxin-testing is provided by the Scottish Salmonella Reference Laboratory, Glasgow and by the Division of Enteric Pathogens and the Food Hygiene Laboratory, Central Public Health Laboratories, Colindale. Since 1980, the data have formed an integral part of the WHO Surveillance Programme for the Control of Foodborne Infections and Intoxications in Europe (Reports, 1980-87).

An outbreak of hospital foodborne infection is defined as an episode affecting two or more persons, usually but not necessarily associated with more than one ward or department, who became ill concurrently after eating hospital-prepared food(s).

EPIDEMIOLOGY

Of the 48 hospital outbreaks reported between 1978 and 1987, 25 were due to *Clostridium perfringens* and 17 to *Salmonella* sp. (Fig. 1). During the same period, 42 outbreaks of hospital-based salmonellosis attributed to faecal-oral spread affecting 220 persons (average of 5 per outbreak) were also recorded, but excluded from the analysis. In four of the five episodes of undetermined aetiology, symptoms of acute diarrhoea and abdominal cramps of less than 24 h duration, with incubation periods between 8 and 24 h following a reheated meat-based dish, were suggestive of *Cl. perfringens* food poisoning, but in each instance no organisms of any significance were isolated nor enterotoxin detected from faecal and/or food samples examined.

Thirty of the outbreaks (62%) were reported during the warmer months from June to October. Whereas *Cl. perfringens* outbreaks featured throughout the year, salmonellosis almost always occurred between June and October; the exception being a turkey-borne outbreak in December 1985.

A total of 2287 persons, mainly patients but also staff and other persons eating hospital-prepared food, were involved in the 48 outbreaks. This compared with 1516 persons in 50 outbreaks during the previous 5 years (Table 1). In the most recent 10-year period, 1176 persons were affected in the 17 salmonella outbreaks (average of 69 per outbreak, range 5-238) and 899 in 25 outbreaks due to *Cl. perfringens* (average of 36, range 6-120); 14 patients were affected in the 1 episode due to *Campylobacter* sp. and 198 in the 5 of undetermined aetiology.

Twelve people died; 9 in salmonella outbreaks and 3 in episodes due to

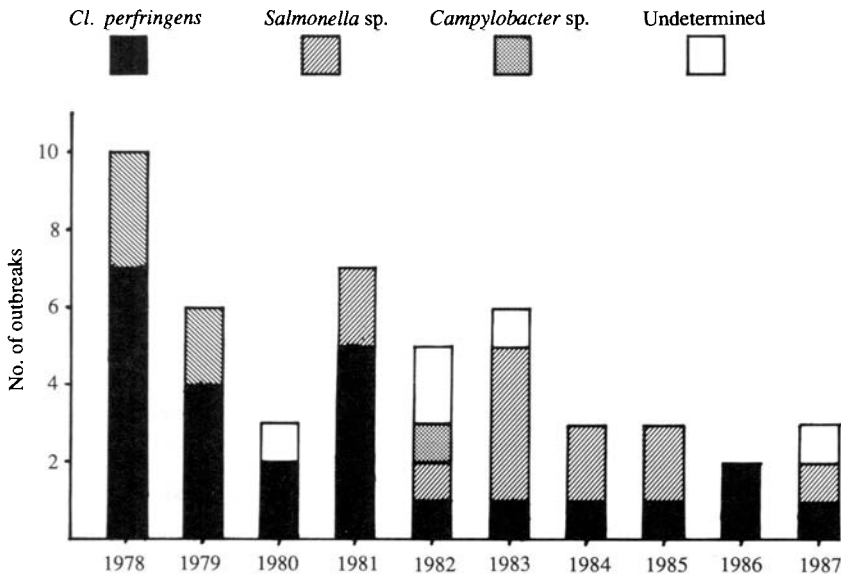


Fig. 1. Annual incidence of outbreaks by aetiological agent, 1978-87.

Table 1. Outbreaks and numbers affected (deaths) by aetiological agent in 5-year periods, 1973-87

	1973-77		1978-82		1983-87	
	Outbreaks	Nos. affected	Outbreaks	Nos. affected	Outbreaks	Nos. affected
<i>Cl. perfringens</i>	31	820 (1)	19	731 (2)	6	168 (1)
<i>Salmonella</i> sp.	11	401 (6)	8	450 (3)	9	726 (6)
<i>Staph. aureus</i>	3	33	—	—	—	—
<i>Campylobacter</i> sp.	—	—	1	14	—	—
Unknown	5	262	3	150	2	48
Totals	50	1516 (7)	31	1345 (5)	17	942 (7)
Average no. affected per outbreak		30		43		55

Cl. perfringens. All but 1 were patients, of whom 6 were psychiatric or mentally subnormal, 3 were geriatric and 2 were in general hospitals. The other death was an elderly man living at home who developed salmonellosis after eating left-over food. Those who died were aged between 34 and 82 years, all of whom were either physically frail and/or suffered from a pre-existing condition such as chronic respiratory disease or a malignancy.

Type of hospital

Outbreaks occurred most frequently in general hospitals (14), psychiatric (13), geriatric (9) and hospitals for the mentally subnormal (7) (Table 2). Thirty-four hospitals were involved in the 48 outbreaks; 24 reported 1 outbreak each and 10 had 2 or more.

Table 2. *Outbreaks by aetiological agent and type of hospital involved, 1978-87*

	<i>Cl. perfringens</i>	<i>Salmonella</i> sp.	<i>Campylobacter</i> sp.	Unknown	Totals
General	7	5	1	1	14
Psychiatric	7	6	—	—	13
Geriatric	6	1	—	2	9
Mentally subnormal	3	2	—	2	7
Maternity	1	3	—	—	4
Other	1	—	—	—	1
Totals	25	17	1	5	48

Table 3. *Type of hospital experiencing two or more outbreaks by aetiological agent, 1978-87*

	<i>Cl. perfringens</i>	<i>Salmonella</i> sp.	<i>Campylobacter</i> sp.	Unknown
Mentally subnormal	3	1	—	1
Psychiatric	2	1	—	—
Geriatric	2	—	—	—
General	—	2	—	—
Psychiatric	—	2	—	—
Psychiatric	1	1	—	—
Psychiatric	1	1	—	—
General	1	1	—	—
General	1	—	1	—
Geriatric	1	—	—	1

One hospital for the mentally subnormal had 5 outbreaks, 1 psychiatric hospital had 3 and 8 others experienced 2 outbreaks each (Table 3). In addition, 4 of these 10 hospitals had reported one or more foodborne outbreaks during the previous 5 years, while 7 other hospitals (3 psychiatric, 1 mentally subnormal, 1 geriatric, 1 maternity and 1 special unit) currently reporting single incidents had also experienced outbreaks in 1973-77.

Foods

Meats were incriminated in 35 (92%) of the 38 outbreaks where a food vehicle was established epidemiologically and/or by the isolation of the same micro-organisms from 'left-over' foods and from those persons affected (Table 4). Various red meat dishes such as brisket of beef, pies, mince and other made-up meats were associated with 16 of the 25 outbreaks due to *Cl. perfringens*, and poultry meat with 9 salmonella outbreaks. In two egg outbreaks due to *Salmonella* spp., one was caused by contaminated mayonnaise and the other by egg-filled bread rolls served in a staff canteen. One *Cl. perfringens* outbreak was associated with vegetable soup made from a proprietary dried stock.

Factors causing outbreaks

Outbreaks by *Cl. perfringens* were invariably attributed to cooking too far in advance, compounded by inadequate chilling and refrigeration and/or re-heating

Table 4. Outbreaks and numbers affected (deaths) by aetiological agent and incriminated food, 1978-87

	Poultry meat/ nos. affected	Other meats/ nos. affected	Egg/ nos. affected
<i>Cl. perfringens</i>	3/180	16/557 (3)	—
<i>Salmonella</i> sp.	9/791 (8)	1/101	2/31
<i>Campylobacter</i> sp.	1/14	—	—
Unknown	—	5/198	—
Totals	13/985 (8)	22/856 (3)	2/31
	Soup/ nos. affected	Unknown/ nos. affected	Total outbreaks/ nos. affected
<i>Cl. perfringens</i>	1/23	5/139	25/889 (3)
<i>Salmonella</i> sp.	—	5/253 (1)	17/1176 (9)
<i>Campylobacter</i> sp.	—	—	1/14
Unknown	—	—	5/198
Totals	1/23	10/392 (1)	48/2287 (12)

prior to serving the following day. Insufficient heat retention in food trolleys combined with undue delay in distribution were significant contributory factors in at least two episodes (Brunton & Moyes, 1980; Walker & Sibbald, 1986). While such also contributed in salmonella outbreaks, cross-contamination or re-contamination of cooked foods from raw foods, usually poultry, was a major initiating factor. Cross-contamination was also implicated in the one outbreak due to *Campylobacter* sp.

DISCUSSION

The hospital as a venue of food poisoning may be over-represented compared with the outside community. More comprehensive reporting of outbreaks is expected from hospitals in that they are semi-closed communities with relatively ready access to laboratory facilities. The significance of some outbreaks, however, particularly in psycho-geriatric units, may not always be apparent and consequently may not be reported.

The proportion of hospital outbreaks to those occurring in the outside community and in other institutions in Scotland fell from 26.6 per cent during 1973-77 to 8.8 per cent in the period under review. This in part may be due to improved reporting generally since 1980 as a consequence of participation in the WHO foodborne disease surveillance programme. There has been both a relative and an absolute decrease in the incidence of hospital foodborne infection in recent years, although the average number of persons affected per outbreak in each of the 5-year periods increased respectively from 30 to 43 to 55 (Table 1). Compared with food poisoning in other types of residential institutions (i.e. prisons, old persons' homes etc.), the hospital however remains predominant (Collier *et al.* 1986).

A marked reduction was observed in particular in the incidence of *Cl. perfringens* food poisoning with 31 outbreaks recorded between 1973 and 1978, falling to 19 and 6 respectively in each of the subsequent 5-year periods (Table 1). This decline in the classic institutional form of food poisoning has been brought about by a wider appreciation of the dangers of insufficient re-heating following inadequate

chilling and refrigeration. In many kitchens the practice of re-heating is being progressively discontinued as more food is being cooked on the day of consumption. The installation of more efficient rapid-cooling equipment also contributed significantly towards the reduction in outbreaks due to *Cl. perfringens*, a facility particularly lacking initially in those hospitals experiencing multiple outbreaks where the same mistakes in failing to apply proper temperature-control were being repeated.

The past 15 years have also seen a significant reduction in the frequency of staphylococcal enterotoxin food poisoning in hospitals in parallel with the decline in its incidence in the general community.

Salmonellosis however has not shown any similar reduction in incidence while the average number affected per outbreak increased in each of the 5-year periods from 36 (1973–77), to 56 (1978–82) and to 81 (1983–87). This almost certainly reflects the increased consumption of chicken, a considerable proportion of which has been shown to be contaminated by salmonella (Gilbert, 1983), and its association with human illness in Britain (Humphrey, Mead & Rowe, 1988; Reilly *et al.* 1988). Nine of the 12 salmonella outbreaks currently reported where a food vehicle was identified were poultry-associated (Table 4). Chicken as a protein source is less expensive than other meats and while its greater use was initially based on economic grounds, the subsequent awareness of the association between blood cholesterol levels and red meat consumption further increased its use in hospitals. Poultry-borne salmonellosis carries a significant monetary cost to the health service and to society in general. A costing study of 1 hospital outbreak affecting 242 patients and staff with 3 deaths in 1985, estimated a total midrange cost of £542 162 and an average cost per case of £2240 (Yule *et al.* 1988).

Bacterial cross-contamination from raw foods, compounded by inadequate temperature control, continues to be a problem in some hospitals. Six hospitals have twice had salmonella outbreaks since 1973, including one which also had three incidents due to *Cl. perfringens*. Several factors increase the risk of cross-contamination, particularly with poultry which is frequently supplied individually packaged therefore requiring more handling at all stages of preparation. Processing after cooking is usually done manually when still warm, while staff shortages or lack of supervision may lead to improper storage, mis-use and inadequate cleaning of equipment. During the past 10 years greater emphasis has been given to the education of catering staff in Scotland in proper food-preparation practices. Whereas the relatively simple message regarding temperature-control has largely been successful, the apparently more complicated concepts required to prevent cross-contamination do not yet appear however to have been fully understood and established.

Sixty percent of outbreaks occurred in long-stay hospitals (i.e. psychiatric, geriatric and those for the mentally subnormal), which comprise only 38% of the 315 hospitals in Scotland (Scottish Hospital Activity Statistics, 1987), while 12 of the 17 hospitals experiencing two or more outbreaks currently or over the 15-year period since 1973 were in this category. Many of these hospitals have older premises with the least modern kitchens. Although the age and structure of a building are not necessarily prerequisites for food poisoning, such conditions can influence attitudes of staff and may lead to inadequate supervision and

malpractices. Many older hospitals also have widely scattered wards and in consequence make more use of the heated-trolley system.

Hospital kitchens have been subject to inspection, by arrangement, by environmental health officers since the mid-1970s. Although it was expected that health boards would consequently more readily comply with the requirements of food hygiene legislation, in practice it was only with the pending removal of Crown immunity in February 1987 that a new realism and urgency for improvement became apparent, the longer term impact of which remains to be seen.

It is also interesting to speculate what effect the current trend towards privatisation of catering services and the introduction of cook-chill methods of food preparation will have on the future incidence of hospital food poisoning.

We extend our thanks to those microbiologists, community medicine specialists and environmental health officers who provided laboratory, clinical and epidemiological details of outbreaks, to Mr Ian Thomson, Area Catering Adviser, Greater Glasgow Health Board, to Dr Richard Gilbert, Food Hygiene Laboratory, Colindale and to Dr Elizabeth Angus respectively for their helpful advice and guidance, and to Mrs Mary Graham and Mrs Suzanne Jardine for secretarial assistance.

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