THE IMPlications of the Food Safety Act 1990 FOR Food Safety in Retailing and Catering in ENGLAND and WALES

by

John Richard Martin

A thesis in fulfilment of the requirement for the award of the Degree of Doctor of Philosophy

1995
SUMMARY

The background to this research is the increasing incidence of food related illness in England and Wales and public concern following a number of food safety scares in the late 1980s. These led to the establishment of the Committee on the Microbiological Safety of Food which reported to Government in 1990 and 1991.

Many concerns highlighted in the report have been addressed by the Government in the Food Safety Act 1990. This Act introduced the most major change in food safety policy this century, and together with supplementary legislation has had implications for the whole of the food trade and for enforcement agencies alike. As is often the case with a major change in legislation, some new provisions have been the subject of criticism. The changes have also highlighted shortcomings in the existing regulatory controls.

In the first phase of this study, retailers' and caterers' views on the implications of the Act were established by postal surveys of 3427 retailers and 3181 caterers in England and Wales. Some 30.3% of retailers and 26% of caterers responded to these surveys.

Two main changes in food hygiene regulations, which are scheduled to become law in 1995, are the requirement for food handling staff to be trained and for food businesses to adopt a HACCP based approach. These two requirements form the main thrust of the new policy to improve the food safety system. Their success will be critical if this approach is
to work. In order to examine the likely success of these new requirements two further phases of study were carried out.

In the second phase, the effectiveness of food hygiene training on food handlers awareness of the causes of food related illness was examined among 235 candidates undergoing the IEHO basic food hygiene training course.

In the third phase, case studies were carried out at 2 retail and 3 catering establishments, of different sizes, in order to examine the extent to which a HACCP type approach had been adopted and to identify obstacles to it's successful implementation.

The findings of the study indicate :-

(a) That the opinions of retailers and caterers were very similar.

(b) That there is a lack of awareness of HACCP and a lack of commitment to it's implementation, particularly amongst smaller businesses.

(c) That a requirement for a full HACCP system would have serious implications for retailers' and caterers', but that the ASC scheme is a more practical approach at the present time. However, it's implementation should be viewed with caution and it should be regarded as a step towards a full HACCP requirement.
(d) That if the ASC approach is to be effective, there is an urgent need to raise awareness of the scheme and its benefits amongst retailers and caterers. There is also a need for the ASC scheme and HACCP to be included more prominently in training courses.

(e) That the overall level of training is low and there is a need to examine further the effectiveness of basic food hygiene training and the influence that the culture of an organisation can have on its success in practice.
## CONTENTS

<table>
<thead>
<tr>
<th>List of Tables</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Figures</td>
<td>3</td>
</tr>
<tr>
<td>List of abbreviations</td>
<td>6</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>8</td>
</tr>
</tbody>
</table>

### CHAPTER 1 INTRODUCTION

1.1 References 17

### CHAPTER 2 THE CHANGING FOOD INDUSTRY

2.1 Introduction 20

2.2 Packaging and Manufacturing processes 20

2.3 The retail sector 22

2.4 The catering sector 27

2.5 References 30

### CHAPTER 3 FOOD RELATED BACTERIAL ILLNESS

3.1 Introduction 31

3.2 Infective bacterial illness 34

3.2.1 Salmonella 34

3.2.2 Campylobacter 37

3.2.3 Yersinia 40

3.2.4 Escherichia coli 43

3.2.5 Vibrio parahaemolyticus 45

3.3 Toxic bacterial illness 45

3.3.1 Staphylococcus 45

3.3.2 Clostridium 47

3.3.3 Bacillus 51

3.4 Other emerging pathogens 53

3.4.1 Listeriosis 53

3.4.2 Aeromonas 55

3.4.3 Enterococcus faecalis 56

3.4.4 Plesiomonas 57

3.5 Discussion 58

3.6 References 60

### CHAPTER 4 FOOD RELATED VIRAL ILLNESS

4.1 Introduction 63

4.2 Small round structured viruses 64

4.3 Rotaviruses 67

4.4 Astrovirus and Calicivirus 67

4.5 Transmission 68

4.6 Discussion 72

4.7 References 72

### CHAPTER 5 FOOD RELATED PROTOZOA ILLNESS

5.1 Cryptosporidiosis 74

5.2 Giardia 75

5.6 Discussion 76

5.7 References 77
10.3 Questionnaire distribution 205
10.4 Questionnaire return 207
10.5 The perceived risks at retail and catering establishments 214
10.6 The perceived causes of food poisoning 220
10.7 The effects of the Act on retailers and caterers 229
10.8 Temperature control 240
10.9 HACCP 257
10.10 Training 269
10.11 Cross-contamination 278
10.12 Other hygiene factors 281
10.13 Conclusions 285
10.14 References 288

Chapter 11 A STUDY OF THE EFFECTS OF BASIC FOOD HYGIENE TRAINING ON THE APPRECIATION OF THE PRINCIPAL CAUSES OF FOOD RELATED ILLNESS 292

11.1 Introduction 292
11.2 Methodology 296
11.3 Results/Discussion 300
11.4 Conclusions 321
11.5 References 324

Chapter 12 CASE STUDIES ON THE APPLICATION OF HACCP IN CATERING AND RETAIL ESTABLISHMENTS 326

12.1 Introduction 326
12.2 Methodology 329
12.3 Case study 1: Catering at a hotel/restaurant unit part of a national chain 332
12.4 Case study 2: Catering at a large hospital unit 345
12.5 Case study 3: Catering at an independent restaurant establishment 357
12.6 Case study 4: Retail delicatessen in a supermarket part of a national chain 363
12.7 Case study 5: Food retailing at an independent grocer/supermarket part of a local chain 371
12.8 Discussion 379
12.9 Conclusions 384
12.10 References 386

CHAPTER 13 Discussion 388

13.1 Introduction 388
13.2 A Critical review of methodology 390
13.3 Enforcement framework 396
13.4 Regulation/Deregulation 401
13.5 Hazard Analysis Critical Control Point 406
13.6 Training 413
13.7 Changes of approach in the food safety system 418
13.8 References 420
<p>| CHAPTER 14. | CONCLUSIONS AND RECOMMENDATIONS | 424 |
| CHAPTER 15. | BIBLIOGRAPHY | 428 |
| APPENDIX A. | Retail questionnaire | 450 |
| APPENDIX B. | Catering questionnaire | 457 |
| APPENDIX C. | Training questionnaire | 465 |
| APPENDIX D. | HACCP audit schedule | 468 |
| APPENDIX E. | Letter to Local Authority Environmental Health Departments. | 472 |</p>
<table>
<thead>
<tr>
<th>Table Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2.1</td>
<td>The number of food handlers working in retail food premises.</td>
<td>24</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>The retail market for chilled foods 1986-1991.</td>
<td>26</td>
</tr>
<tr>
<td>Table 2.3</td>
<td>Catering premises by type in England and Wales.</td>
<td>28</td>
</tr>
<tr>
<td>Table 2.4</td>
<td>The overall health risk in different categories of catering premises.</td>
<td>29</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>A nomenclature scheme for the classification of small round structured viruses.</td>
<td>65</td>
</tr>
<tr>
<td>Table 6.1</td>
<td>Food vehicles involved in outbreaks of Campylobacter infection in England and Wales.</td>
<td>97</td>
</tr>
<tr>
<td>Table 6.2</td>
<td>Foodborne Botulism in the U.K.</td>
<td>102</td>
</tr>
<tr>
<td>Table 6.3</td>
<td>Outbreaks of suspected viral gastroenteritis reported to CDSC between 1981 and 1990.</td>
<td>113</td>
</tr>
<tr>
<td>Table 9.1</td>
<td>The return of retailers and caterers addresses by Local Authority type in England and Wales.</td>
<td>194</td>
</tr>
<tr>
<td>Table 9.2</td>
<td>The distribution and return of retail and catering questionnaires by Local Authority type in England and Wales.</td>
<td>198</td>
</tr>
<tr>
<td>Table 10.1</td>
<td>Retailers perception of the importance of factors as causes of food poisoning.</td>
<td>222</td>
</tr>
<tr>
<td>Table 10.2</td>
<td>Caterers perception of the importance of factors as causes of food poisoning.</td>
<td>226</td>
</tr>
<tr>
<td>Table 10.3</td>
<td>Retailers views on the effectiveness of the legal provisions within the Food Safety Act 1990 in preventing food poisoning.</td>
<td>234</td>
</tr>
<tr>
<td>Table 10.4</td>
<td>Retailers views on the importance of a variety of hygiene factors to the safe operation of their business.</td>
<td>242</td>
</tr>
<tr>
<td>Table 10.5</td>
<td>The importance of temperature control as a factor leading to cases of food poisoning as perceived by different sized retail establishments.</td>
<td>250</td>
</tr>
<tr>
<td>Table 10.6</td>
<td>Caterers views on the importance of hygiene factors to the safe operation of their business.</td>
<td>253</td>
</tr>
</tbody>
</table>
Table 10.7 The types of work systems being operated by caterers.

Table 10.8 The scale of importance attached to HACCP in the safe operation of retail establishments as perceived by different levels of staff.

Table 10.9 Assessment of the importance of HACCP in establishments where in house staff training in HACCP provided.

Table 10.10 The types of work system being operated by retailers.

Table 10.11 The scale of importance of HACCP in the safe operation of catering establishments as perceived by different levels of staff.

Table 10.12 Retailers formal qualifications in food safety.

Table 10.13 Caterers formal qualifications in food safety.

Table 11.1 Candidates perception of the importance of factors as causes of food poisoning prior to training.

Table 11.2 Candidates perception of the importance of factors as causes of food poisoning after training.
<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 6.1</td>
<td>Cases of Food Poisoning in England and Wales notified to the OPCS 1949-1993.</td>
<td>87</td>
</tr>
<tr>
<td>Figure 6.2</td>
<td>Laboratory reports to CDSC of human Salmonella infection in England and Wales 1970-1993.</td>
<td>89</td>
</tr>
<tr>
<td>Figure 6.3</td>
<td>Laboratory reports to CDSC of human Campylobacter infection in England and Wales 1980-1993.</td>
<td>93</td>
</tr>
<tr>
<td>Figure 6.4</td>
<td>Laboratory reports to CDSC of human Yersiniosis infection in England and Wales 1975-1993.</td>
<td>96</td>
</tr>
<tr>
<td>Figure 6.5</td>
<td>Laboratory reports to CDSC of human Staphylococcus aureus infection in England and Wales 1980-1989.</td>
<td>99</td>
</tr>
<tr>
<td>Figure 6.6</td>
<td>Laboratory reports to CDSC of human Clostridium perfringens food poisoning in England and Wales 1980-1989.</td>
<td>100</td>
</tr>
<tr>
<td>Figure 6.7</td>
<td>Laboratory reports to CDSC of human Bacillus cereus infection in England and Wales 1980-1989.</td>
<td>104</td>
</tr>
<tr>
<td>Figure 6.8</td>
<td>Laboratory reports to CDSC of human Verocytotoxin producing E.coli O 157 infection in England and Wales 1981-1993.</td>
<td>105</td>
</tr>
<tr>
<td>Figure 6.9</td>
<td>Laboratory reports to CDSC of human Listeriosis in England, Wales and Northern Ireland 1983-1992.</td>
<td>107</td>
</tr>
<tr>
<td>Figure 6.10</td>
<td>Laboratory reports of human Aeromonas infection in England and Wales 1981-1993.</td>
<td>110</td>
</tr>
<tr>
<td>Figure 6.11</td>
<td>Laboratory reports to CDSC of human Plesiomonas infection in England and Wales 1975-1993.</td>
<td>111</td>
</tr>
<tr>
<td>Figure 6.12</td>
<td>Laboratory reports of human gastrointestinal virus infections in England and Wales 1993.</td>
<td>112</td>
</tr>
<tr>
<td>Figure 6.13</td>
<td>Laboratory reports of human Cryptosporidiosis infection in England and Wales 1983-1986.</td>
<td>117</td>
</tr>
<tr>
<td>Figure 6.14</td>
<td>Laboratory reports of human Giardiasis in England, Wales 1980-1993.</td>
<td>119</td>
</tr>
<tr>
<td>Figure 6.15</td>
<td>Laboratory reports to CDSC of human Vibrio parahaemolyticus infection in England and Wales 1980-1989.</td>
<td>120</td>
</tr>
<tr>
<td>Figure 7.1</td>
<td>Public perception of the causes of food</td>
<td>140</td>
</tr>
</tbody>
</table>
poisoning.

Figure 7.2 Factors contributing to 1044 outbreaks of food poisoning in England and Wales between 1970 and 1979.

Figure 9.1 Geographical distribution of Local Authorities from which caterers and retailers questionnaires were returned.

Figure 10.1 Return of retail questionnaires by establishment size.

Figure 10.2 Return of retail questionnaires by type of business.

Figure 10.3 Return of catering questionnaires by establishment type.

Figure 10.4 The number of meals prepared per day by caterers.

Figure 10.5 Types of catering operations carried out by caterers.

Figure 10.6 The perceived potential risk from retail businesses.

Figure 10.7 The perceived potential risk from food preparation carried out by caterers.

Figure 10.8 The effects of the Food Safety Act 1990 on retailers.

Figure 10.9 Retailers views on the effectiveness of Improvement Notices.

Figure 10.10 Retailers views on whether a licensing system for food premises would help to prevent food poisoning.

Figure 10.11 The effects of the Food Safety Act 1990 on caterers.

Figure 10.12 Caterers views on the effectiveness of Improvement Notices.

Figure 10.13 The frequency at which retailers check the temperature of food in refrigeration units.

Figure 10.14 Types of thermometer used by retailers to monitor food temperatures.
<p>| Figure 10.15 | The frequency at which caterers check the temperature of food in refrigeration units. |
| Figure 10.16 | Types of thermometer used by caterers to monitor food temperatures. |
| Figure 10.17 | Caterers views on the importance of HACCP systems in preventing food poisoning from catering operations. |
| Figure 10.18 | Caterers views on the practicality of HACCP within their own catering operations. |
| Figure 10.19 | In-house staff training provided by retailers. |
| Figure 11.1 | Types of establishment in which candidates worked. |
| Figure 11.2 | The number of meals prepared per day in establishments in which candidates employed. |
| Figure 11.3 | Candidates reason for attending the course. |
| Figure 11.4 | Candidates views on the benefit of the course. |
| Figure 11.5 | Candidates views on the effect of the course on the way they worked. |
| Figure 11.6 | Changes candidates intend to make in their work as a result of the course. |</p>
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACMSF</td>
<td>Advisory Committee on the Microbiological Safety of Food</td>
</tr>
<tr>
<td>ASC</td>
<td>Assured Safe Catering</td>
</tr>
<tr>
<td>BSE</td>
<td>Bovine Spongiform Encephalopathy</td>
</tr>
<tr>
<td>CDSC</td>
<td>Communicable Disease Surveillance Centre</td>
</tr>
<tr>
<td>CIEH</td>
<td>Chartered Institute of Environmental Health</td>
</tr>
<tr>
<td>DEP</td>
<td>Department of Enteric Pathogens</td>
</tr>
<tr>
<td>DOH</td>
<td>Department of Health</td>
</tr>
<tr>
<td>DTI</td>
<td>Department of Trade and Industry</td>
</tr>
<tr>
<td>EHEC</td>
<td>Enterohaemorrhagic Escherichia coli</td>
</tr>
<tr>
<td>EIEC</td>
<td>Enteroinvasive Escherichia coli</td>
</tr>
<tr>
<td>EPEC</td>
<td>Enteropathogenic Escherichia coli</td>
</tr>
<tr>
<td>EPN</td>
<td>Emergency Prohibition Notice</td>
</tr>
<tr>
<td>ETEC</td>
<td>Enterotoxigenic Escherichia coli</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis Critical Control Point</td>
</tr>
<tr>
<td>HTST</td>
<td>High Temperature Short Time</td>
</tr>
<tr>
<td>IID</td>
<td>Infectious intestinal disease</td>
</tr>
<tr>
<td>IN</td>
<td>Improvement Notice</td>
</tr>
<tr>
<td>LA</td>
<td>Local Authority</td>
</tr>
<tr>
<td>LACOTS</td>
<td>Local Authorities Co Ordinating Body on Food and Trading Standards</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid crystal display</td>
</tr>
<tr>
<td>MAFF</td>
<td>Ministry of Agriculture Fisheries and Food</td>
</tr>
<tr>
<td>OPCS</td>
<td>Office for Population and Census Studies</td>
</tr>
<tr>
<td>PO</td>
<td>Prohibition Order</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
<tr>
<td>RSH</td>
<td>Royal Society of Health</td>
</tr>
<tr>
<td>SEA</td>
<td>Staphylococcal enterotoxin</td>
</tr>
<tr>
<td>SGMSF</td>
<td>Steering Group on the Microbiological Safety of Food</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>SRSV</td>
<td>Small round structured viruses</td>
</tr>
<tr>
<td>RSV</td>
<td>Round structured virus</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

I am indebted to the many people who have helped me throughout the course of this research, but I would particularly like to thank the following:-

Mr N.J.D.Payne for his support and encouragement in undertaking this research.

Dr. Michael Kipps for his advice, and guidance during the course of the research.

Dr. Simon Moseley for his advice and help.

Most importantly my wife Yasmin and children Robert and Ruth who have patiently waited for me to emerge from the study and without whose help and support it would not have been possible.
CHAPTER 1 INTRODUCTION

Recent years have seen a huge increase in cases of food related illness in England and Wales. Reported cases of food poisoning have risen from ten thousand in 1980 to over eighty thousand in 1994 (OPCS 1994). This level of illness is a matter of serious concern particularly since there is general consensus that cases are under-reported perhaps by as much as an order of magnitude (Sockett 1991).

During the same period a series of highly publicised food scares including Botulism in hazelnut yogurt, Salmonella in eggs, Salmonella in baby food, Listeria in cook-chill foods and soft cheeses, and Bovine Spongiform Encephalopathy (BSE) in beef have all received extensive coverage in the media and this has raised the level of public interest in food safety.

Although food safety concerns a wide range of health issues, including food adulteration and nutritional content, the primary concern is with the prevention of food related illness. Current illnesses, their incidence and cost are reviewed in Chapters 3, 4, 5 and 6.

Food related illness may be defined as "an illness caused by food or drink contaminated by pathogenic micro-organisms or their toxins, or by chemicals" (Richmond 1990).

These illnesses would, therefore, include "food poisoning", the generic term for a range of illnesses characterised by diarrhoea and/or vomiting.
resulting from the consumption of contaminated food, and foodborne illnesses such as Listeriosis or Botulism which can give rise to disease in parts of the body other than the gastro-intestinal tract.

For the purposes of collecting statutory epidemiological data, food related illnesses are collectively notified as "Food Poisoning". This is defined as "any disease of an infectious or toxic nature caused or thought to be caused by the consumption of food or water" (DOH 1992). The definition, therefore, includes all waterborne illness regardless of the presenting symptoms and signs, acute illnesses characterised by diarrhoea and/or vomiting and also those diseases whose symptoms appear unrelated to the intestinal tract. It does not, however, include certain diseases meeting these criteria but which are notifiable in their own right such as Hepatitis A or Dysentery.

Whilst some of the increase in food related illness can be accounted for by raised awareness amongst GPs and the public, better reporting, and improved laboratory methods, there is nevertheless a significant increase in the general level and this needs to be set against a background of considerable technological and socio-economic change.

Since the industrial revolution, but particularly since the Second World War these changes have radically affected food production, manufacturing, retailing and catering practice at a time of changing consumer awareness and behaviour.
Increasing mechanisation, population growth, and in particular the First and Second World Wars led to a national agricultural policy intended to provide a self-sufficient agricultural base within the UK. More recently, this policy has increasingly been influenced by the European Community Common Agricultural Policy since the United Kingdom joined the European Community in 1975.

Since early this century, agricultural practices have been influenced by increasing mechanisation, by intensive farming techniques and by scientific research intended to increase production yields for a wide variety of animal and vegetable species. Changes, particularly in the use of intensive farming systems for animal rearing, have led to new problems, not least from the increased opportunity for infection to spread within animal populations held in close contact, and from the use of animal by-products as feeding supplements. The latter is most graphically demonstrated by the impact of Bovine Spongiform Encephalopathy (BSE).

Rapid technological advancement within food manufacturing and packaging has led to new methods such as vacuum packaging, cuisine sous-vide, cook-chill, and Ohmic heating. Each of these processes carries its own potential safety risks and can provide new niches for existing and emerging pathogens to exploit. The pace of this technological development has progressed even faster than the awareness of new potential dangers, the technology to control them and the legislative controls that are necessary.
Concurrent with these advancements have been major socio-economic changes which have altered consumption patterns and customer expectation. Since the Second World War there has, for example, been an increase in the number of women in employment outside the home, in the number of people living alone and in the amount of disposable income. At the same time, the average working week has decreased to below forty hours. These changes combined with the widespread availability of prepared, processed and convenience foods, and the growth of the supermarket have led to a massive increase in consumer demand for pre-prepared and convenience foods.

The number of meals eaten outside the home and the mean weekly household expenditure on them has continued to increase, rising from 3.01 meals eaten out per person per week in 1980 to 3.76 per person in 1990 (MAFF 1990). Some £8.68 per household per week was spent on meals purchased outside the home in 1990 compared to £4.31 in 1980 (MAFF 1990). The post-war years have not surprisingly, therefore, seen hotel and catering enterprises develop into a significant industry within a widely diversified food service sector.

Particularly interesting has been a progressive move away from traditional food production methods towards the production of meals in anticipation of requirements and in some instances transportation over considerable distances to meet consumer demands (Walker 1988).
Food regulation in England and Wales can be traced back to 1266, however, early legislation dealt primarily with fiscal matters. The first main elements of modern food law dealing with public health were contained in the Food Act 1938, which consolidated the Food and Drink Act 1860 and the Sale of Food and Drugs Act 1875.

The Food Act 1938 with minor amendments was, together with subsidiary legislation, consolidated into the Food and Drugs Act 1955 which in turn was subsequently consolidated into the Food Act 1984. Essentially, therefore, the legal provisions remained little changed from the principal elements set out in 1860 and 1875.

By the late 1980s, therefore, food law had failed to keep pace with the changes in production, manufacture, preparation, and catering and retail practices. In addition increasing requirements were imposed by Britain's membership of the European Community, and in particular the need for harmonisation in food safety regulation between member states in order to prepare for the "open market" from 1st January 1993.

Against this background, and following a five year full scale review of food law, the Government announced on 21st February 1989 the setting up of a Committee on the Microbiological Safety of Food under the chairmanship of Sir Mark Richmond. The committee was specifically asked to consider the increasing incidence of microbiological illnesses of foodborne origin, particularly from Salmonella, Listeria, and Campylobacter. Further, to establish whether this was linked to changes in agriculture, food production, technology, distribution,
retailing, or catering and to recommend action where appropriate. The Committee's first report was published in January 1990 (Richmond 1990), the second in 1991 (Richmond 1991).

In July 1989 a White Paper (HMSO 1989), "Food Safety - Protecting the Consumer" setting out the Government's policy on food safety, was published and subsequently the Food Safety Bill was introduced into the House of Lords on the 22 November 1989 receiving Royal Assent on the 29th June 1990.

The aim of the Food Safety Act 1990 (HMSO 1990) is to control all aspects of food safety throughout the food distribution chain. It retains and bolsters the main structure of offences concerned with food safety enshrined in previous legislation, introduces a new important defence of "due diligence" and revises and improves the prescriptive powers of enforcement creating new powers to deal with emergencies. Detailed requirements are specified in regulations and codes of practice with which enforcement agencies as well as the trade must comply. A more detailed review of the Act is given in Chapter 8.

Food safety control systems vary throughout the world and in most instances have been devised to suit local characteristics. The World Health Organisation review of such systems within Europe (WHO 1988) concluded that there was "a continued wide diversity in the structure and organisation of the various national food safety and control services. These national differences reflect the geographical characteristics, the social and economic development and the political
philosophy of individual nations". Further, that the most important factor is "the degree of uniformity that exists amongst these countries concerning the purposes and objectives contained in their national legislation for the protection of the health of the consumer and promotion of food safety".

Traditionally within the UK and other member states of the European Community prescriptive food safety controls have been applied. Within the UK, policy since the introduction of the Food Safety Act 1990 has shifted towards less prescription and greater deregulation. This approach results at least in part from criticism, particularly from large retail and catering organisations, of inadequacies in the historical approach to food safety. In particular, that legislation and its enforcement were not directed at important areas of risk and that there was inadequate uniformity of enforcement. At a time of economic recession these failures were perceived as being an unacceptable burden on business.

This change of approach to food safety places increasing emphasis on self regulation, training, and the application of HACCP by proprietors of retail and catering establishments. Guidance on standards for particular sectors will be set out in Industry Guides to Good Practice, which will be formulated in part by representatives from these sectors.

This approach is analogous to that introduced by the Health and Safety at Work Act 1974 (HMSO 1974) the purpose of which was to deal with workplace safety. It is significant that since 1974, that approach has
not reduced the overall level of accidents in the workplace. There is, therefore, good reason to question whether a similar approach to food safety is likely to be successful in reducing the incidence of food related illness.

The introduction of the Food Safety Act 1990 and supplementary regulations and codes of practice made under it have been the most important change in UK food legislation this century. The changes have particular implications for food retailers and caterers who together constitute some 91.9% of food premises subject to inspection (MAFF 1994). Many of these are small businesses which are less likely to have the technical support, hygiene training facilities, or financial wherewithal which they may need in order to comply with the Act and changes resulting from it.

It is against this background that the current study was undertaken. The objectives of the study were:

(i) To review the need for change to the food safety control system within the UK and analyse the reasons underlying that need.

(ii) To examine the implications of the changes resulting from the Food Safety Act for the food industry, and in particular catering and retailing businesses.

(iii) To examine the practical effect of these changes on the
food industry and in particular on the retail and catering sectors.

(iv) To examine the effects of the changes on the incidence of food related illness in England and Wales.

(v) To review the causes of food related illness in England and Wales and identify whether these are adequately addressed and controlled by the Food Safety Act 1990.

(vi) To examine the potential role of the hazard analysis critical control point (HACCP) technique within England and Wales.

(vii) To review the importance and potential role of training within retailing and catering in England and Wales.

(viii) To suggest further changes and improvements necessary to improve the food safety control system.

1.1 REFERENCES

DOH, 1992. Letter PL/CMO(92)14 Definition of Food Poisoning 21/9/92.


CHAPTER 2 THE CHANGING FOOD INDUSTRY

2.1 INTRODUCTION

Social and economic changes have created new demands on the retail and catering sectors. Both have diversified, widening the range of foodstuffs available. Methods of food packaging, preservation, preparation, storage and display have changed to accommodate these demands. In addition, new technologies and packaging methods such as vacuum packing have become common in retail and catering establishments and may provide new niches which micro-organisms are able to exploit.

This Chapter briefly reviews the major changes that have taken place within the retail and catering sectors, in order to provide a background against which the new food safety controls can be considered. The effects of these new controls and their likely success in helping to reduce the increase in food related illness are considered later within this study.

2.2 PACKAGING AND MANUFACTURING PROCESSES

There are several new processes which result in either vacuum or modified atmosphere packaging of chilled foods reaching the retail and catering market. These include vacuum packaging, vacuum skin packaging, modified atmosphere packaging, and sous-vide. Vacuum packaging, which involves the removal of all or most of the air within a package without its deliberate replacement with another gas mixture, is
used to extend shelf life by inhibiting the growth of aerobic spoilage micro-organisms and to reduce deterioration of the product due to oxidation.

One of the traditional applications of vacuum packaging which has been in use for over 30 years, is for primal cuts of red meat and bacon. More recently, vacuum packaging has been used for retail packs of cooked meats, pates, fish and prepared vegetables. Only in recent years has it been used within the catering industry as a means of food preservation/preparation, and as a cooking technique, e.g. cuisine sous-vide. Significantly, vacuum packaging machines are being sold on the domestic market, particularly to small businesses where the potential risks involved with the process may not be realised.

Vacuum Skin Packaging (VSP)

This packaging technique, which was developed to overcome some of the disadvantages of traditional vacuum packaging, relies on a highly ductile plastic barrier which is gently draped over a food product and moulds itself to the actual contours of the product to form a second skin. In this way, the products natural shape, colour and texture are highlighted and since no mechanical pressure is applied during the vacuum process, soft products are not crushed or deformed. Typically, this is used within the United Kingdom for foods such as cooked and cured sliced and whole meats, pate and fish products.
Cuisine Sous-Vide

This technique, which was developed in France in the early 1970s', involves a vacuum cooking process which utilises multi-layered plastic pouches that reduce the shrinkage of product from 16% to only 5%. In the system, raw materials are prepared and if necessary partially cooked. The food is then packaged in plastic pouches which are both heat stable, and impermeable to air and moisture. A vacuum is then applied to the pouch in order to remove the air, and the pouch is sealed. The pouch is cooked to a time/temperature pasteurisation treatment and then rapidly cooled and packaged into protective cartons. The products are then stored at or below 3°C. Re-heating of the products can be done in the pouch in moist heat or the contents removed and re-heating undertaken by conventional means.

The process has a number of potential hazards. These include the thermal process which may not destroy spores of Clostridium botulinum, the anaerobic conditions produced within the pouch, the conditions of cooling following pasteurisation, and the lack of an effective chill chain. Any of these may permit the growth of Clostridium botulinum.

2.3 THE RETAIL SECTOR

The structure of the retail food sector has undergone substantial change since the 1960s'. The number of large supermarkets and hyper-stores has significantly increased, whilst there has been a corresponding fall in the number of traditional family grocers. In 1993 there were 221,123
retail food outlets (MAFF 1994). The ten largest retail chains are responsible for approximately 50% of all retail sales of food (Richmond 1991). Retail co-operatives and small independent retailers who belong to consortia such as "Mace", "Spar", "VG", "Happy Shopper", each have approximately 5% of retail food sales.

Food retailing is a large employer, with over 600,000 staff in 1989, of whom some 50% worked part-time. An Audit Commission Survey (1990) found that an average of 22.3 staff per premises handled food in supermarkets and grocers whilst there was an average of only 4.1 in smaller open food retailers (Table 2.1).

Although the number of reported outbreaks of food related illness associated with retail premises is small, any failure in food safety has the potential to affect significant numbers of people. Since illness from such outlets is likely to be widely scattered, retail associated cases are likely to be under-reported. It is significant that the majority of reported cases of food poisoning are sporadic and not associated with any particular identifiable source. Many of these cases may, therefore, be associated with retail premises.

The sale of chilled and frozen foodstuffs has become an important part of food retailing, with some 60% of supermarket display shelving being devoted to such products. For almost a decade one of the fastest growing sectors of the UK food retail market has been that of chilled foods such as ready meals, prepared salads, pizza and pasta. Between
Table 2.1  Number of Food Handlers per retail Premise

<table>
<thead>
<tr>
<th>Type of Business</th>
<th>Average</th>
<th>Lower Quartile</th>
<th>Upper Quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermarkets, Grocers etc.</td>
<td>22.3</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Open food retailers, e.g. butchers</td>
<td>4.1</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Audit Commission 1990
1986 and 1991 sales of ready meals grew by 212%, pre-packaged salads by 227%, pizza by 367% and pasta by 320% (Table 2.2) (EIU 1992).

A number of factors have influenced the growth in sales of ready made meals. These include the increasing number of working women requiring easily prepared convenience meals, the movement away from regular eating patterns, increasing domestic use of microwave ovens, the increase in the number of single person households from 4.6 million in 1980 to 5.9 million in 1991, and a general move towards lighter meals and greater health and weight consciousness.

The retail sector includes butchers and bakers, both of whom may diversify into selling a range of products not traditionally within their remit. For example, butchers commonly diversify into cooking and/or selling chilled cooked meats, pies, pasties and sandwiches/rolls. Similarly, bakers commonly sell chilled cooked meats, meat pies, sausage rolls, Cornish pasties, ice cream and soup. In both cases there is an increased potential for cross-contamination to occur. There have been a number of reported outbreaks of illness associated with cooked meats prepared by small concerns (CDR 1992). Over half of these sources were retail butchers and in one incident, cooked meat supplied by a single retail butcher infected 640 people with Salmonella.

Whilst major retail companies have a high degree of control over factors such as the quality of supplies, distribution, outlet design, and staff training, many of the smaller independent retailers are limited in the control they can exercise over many of these factors. In addition,
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready Meals</td>
<td>115</td>
<td>143</td>
<td>166</td>
<td>182</td>
<td>210</td>
<td>244</td>
</tr>
<tr>
<td>Pre-packed salads</td>
<td>44</td>
<td>50</td>
<td>58</td>
<td>70</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>Pizza</td>
<td>30</td>
<td>42</td>
<td>58</td>
<td>70</td>
<td>93</td>
<td>110</td>
</tr>
<tr>
<td>Pasta</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>194</td>
<td>242</td>
<td>291</td>
<td>336</td>
<td>400</td>
<td>470</td>
</tr>
</tbody>
</table>

Source: EIU 1992
many simply lack the expertise or wherewithal to provide adequate staff training. This may in part, explain the finding of a survey in 1989, (Audit Commission 1990) which revealed a significant overall health risk in 11-12% of supermarkets and grocers with less than 10 employees as compared to 5% of those with 16-49 employees and none in those with 50 or more employees.

2.4 THE CATERING SECTOR

The catering industry has a wide diversity of outlets (Table 2.3). It forms one of the largest industries in the UK, some 347,135 restaurants and other caterers operating in 1993 (MAFF 1994). The Gross Domestic Product of the industry was £73 billion in 1991 (HMSO 1992).

The industry is composed primarily of small independent businesses, the four largest national companies representing a turnover of less than 10% of the total. It is one of the largest employers and the most labour intensive of the food sector.

Eating out has increased considerably and new styles of catering have developed. Catering at pubs and accommodation establishments are the largest sector, but there has also been growth in fast food operations such as hamburger and pizza establishments, roadside restaurants, ethnic restaurants and takeaways. A survey of caterers in 1989 (Audit Commission 1990) revealed that almost one in five takeaways and more than one in six restaurants, cafes and caterers were a significant health risk (Table 2.4).
Table 2.3 Catering Premises by type in England and Wales in 1990/1991

<table>
<thead>
<tr>
<th>Type of Premises</th>
<th>Estimated Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels and Guest Houses</td>
<td>25,857</td>
</tr>
<tr>
<td>Restaurants, cafes and take-aways</td>
<td>55,141</td>
</tr>
<tr>
<td>Pubs, clubs and bars with food</td>
<td>56,330</td>
</tr>
<tr>
<td>Hospitals</td>
<td>1,743</td>
</tr>
<tr>
<td>Educational Establishments</td>
<td>19,183</td>
</tr>
<tr>
<td>Factory and Government Buildings</td>
<td>6,484</td>
</tr>
</tbody>
</table>

Source: IEHO 1991
Table 2.4 Overall health risk in different categories of catering premises

<table>
<thead>
<tr>
<th>Type of Premises</th>
<th>Degree of Overall Health Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Significant or Imminent</td>
</tr>
<tr>
<td>Take-aways</td>
<td>19%</td>
</tr>
<tr>
<td>Restaurants, cafes and canteens</td>
<td>17%</td>
</tr>
<tr>
<td>Hotels and guest houses</td>
<td>13%</td>
</tr>
<tr>
<td>Pubs, clubs and bars</td>
<td>11%</td>
</tr>
<tr>
<td>Hospitals</td>
<td>7%</td>
</tr>
<tr>
<td>Residential homes</td>
<td>6%</td>
</tr>
<tr>
<td>Schools and colleges</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: Audit Commission 1990
2.5 REFERENCES


CHAPTER 3 FOOD RELATED BACTERIAL ILLNESSES

3.1 INTRODUCTION

A variety of diseases can result from the consumption of food contaminated with pathogenic micro-organisms or their toxins. The major aim of food safety is to prevent diseases being transmitted by this route. This primary concern was addressed by Richmond (1990) and subsequently by the Government, which introduced the Food Safety Act 1990 (HMSO 1990) as the main legislative control.

In order to evaluate how effective food safety legislation is likely to be in preventing food related illness, it is considered important within this study to briefly review the nature, level and cost of such infections. As well as helping to identify the major factors involved in cases of food related illness, this information is also important in identifying how new niches have and could be exploited by the organisms involved. Such information is also helpful in assessing whether food safety policy and legislative controls will be effective at a practical level. It can also assist in identifying further measures, changes and controls that could improve food safety in catering and retail establishments.

In considering such illnesses different authors have used a variety of terms to describe groups of food related infection. Such terms include "Food Poisoning", "Food Intoxication", and "Foodborne" illness. In categorising diseases into these groups a number of criteria have been
used. These include the organism involved, whether the organism is able to multiply in food, whether the organism or the toxin it produces is the cause of the illness, whether gastroenteritis is the predominant symptom, and whether the food is merely the vehicle by which the organism infects humans.

Whilst there is an overall degree of consensus, there remains variations in how each group is defined. The distinction between foodborne disease and food poisoning is not always clear cut and organisms do not always fall conveniently into one particular group. Food poisoning, however, is generally considered to be an illness characterised by diarrhoea and/or vomiting which follows the consumption of contaminated food. Other illnesses, for example Listeriosis, Botulism and Tuberculosis, although contracted through the consumption of contaminated, food give rise to symptoms and disease in parts of the body other than the alimentary tract.

A review of the definitions used in common training and reference textbooks used by food workers illustrates this point.

Hobbs and Roberts (1987) consider food poisoning to be "an acute gastroenteritis manifested as a disturbance of the gastrointestinal tract, with abdominal pain and diarrhoea and with or without vomiting or fever. Usually large numbers of the organisms actively growing in the food are required to initiate symptoms of infection (invasion of and multiplication on or in the body), or intoxication (poisoning by toxin produced in the food or in the body)". 
Johns (1991) considers food poisoning to be "a mild, short lived type of illness i.e vomiting, diarrhoea, sometimes with other symptoms. Food poisoning is usually caused by bacteria, viruses or the toxins naturally present in fish or plants. Usually a relatively large quantity of micro-organisms or toxin is regarded as necessary to cause illness but this is not always the case". He defines foodborne diseases as "severe frequently fatal diseases, such as typhoid fever, which are transmitted by contaminated food. Because the organisms tend to be virulent, tiny numbers may be enough to cause symptoms".

The "Basic Food Hygiene Certificate Coursebook" (IEHO 1992) refers to food poisoning as "an illness you get by eating contaminated food. Food is contaminated if there is something in it which shouldn't be there. Symptoms of food poisoning are abdominal pain, diarrhoea, vomiting, nausea, and fever". Foodborne diseases are described as "diseases carried by food and water. These diseases are also caused by bacteria and other microbes such as viruses but they are different because they are harmful in small numbers. Campylobacter enteritis is a common food borne disease. Other diseases include typhoid, cholera and dysentery."

The Royal Society of Health Certificate Handbook defines food poisoning as "conditions caused by the ingestion of contaminated food or drink in which the main symptoms are usually diarrhoea or vomiting singularly or together often accompanied by nausea or stomach pains. The modern definition of food poisoning includes in addition food and water borne illnesses which have different symptoms" (Donaldson 1993).
Richmond (1990) defined foodborne illness as one "caused by food or drink contaminated by pathogenic micro-organisms or their toxins, or by chemicals".

Although of academic importance the use of terms such as "Food Poisoning" and "Foodborne" may serve as a source of confusion to the lay food worker who must use similar hygiene techniques to deal with both. Such confusion can also influence the reported "official incidence" of food related illness which is notified through the OPCS as "food poisoning", and this point is considered further in chapter 6.

This chapter reviews the principal bacteria responsible for food related diseases in England and Wales. Amongst these are long established pathogens such as Salmonella, together with "new" or "emerging" pathogens which have been implicated as causes of illness comparatively recently, or which have emerged as a result of new food technologies providing new niches which the organism has been able to exploit.

3.2 INFECTIVE BACTERIAL ILLNESSES

3.2.1 Salmonella

Salmonellae are Gram-negative, motile bacilli that are able to grow under aerobic and anaerobic conditions at temperatures between 7°C and 48°C, at pH 4 to 8 and at water activities above 0.93 (Baird-Parker 1991).
The genus Salmonella, whose natural habitat is the intestinal tract of humans and other animals, is comprised of over 2,000 serotypes of which some 400 species have been demonstrated to cause illness in man. All species are considered potential pathogens.

The virulence and infective dose of Salmonella is strain dependent and affected by the susceptibility of an individual as a function of his or her age and state of health. For individuals in poor health, a relatively low dose of Salmonella can produce illness (Blaser and Newman 1982).

Illnesses caused by Salmonellae commonly present as one of three main syndromes: Typhoid, Paratyphoid or Salmonellosis. Typhoid and Paratyphoid are both transmitted by the faecal-oral route and may, therefore, be foodborne. Food safety controls are important in preventing their transmission, however, the incidence of infection acquired within England and Wales is very small compared to that from other Salmonella species. When food related cases of Typhoid and Paratyphoid occur in England and Wales, the source is normally an imported food or a foodstuff contaminated by an "infected" food handler. Salmonellosis is, for the purposes of this study, considered to be more significant in relation to infection acquired in England and Wales and, therefore, Typhoid and Paratyphoid are not separately reviewed within this section.
Salmonellosis

The third and most common type of Salmonella infection is that producing the gastroenteritic syndrome, often termed Salmonellosis or Salmonella food poisoning. It is caused by other species of Salmonellae of which 150 have been associated with human disease. These produce a spectrum of illness ranging from mild to severe gastrointestinal upset to a more severe, debilitating illness which may require admission to hospital.

Symptoms include acute enterocolitis, with the sudden onset of headache, abdominal pain, diarrhoea, nausea and sometimes vomiting. Fever is nearly always present and anorexia and loose bowels often persist for several days. The infection may begin as an acute enterocolitis but can develop into enteric fever with septicaemia or focal infection. Dehydration is commonly associated with the infection and can be especially severe amongst infants and the elderly in which groups most deaths occur. Mortality amongst persons not within these two groups is uncommon, however, the infection does cause considerable morbidity. In some outbreaks over 20% of cases may be admitted to hospital (Gill 1983) and some 1.5% of laboratory reported infections have systemic complications such as septicaemia, meningitis and bone and joint abscesses (Galbraith et al 1987).

Transmission occurs by the faecal-oral route, the reservoir for the organisms being domestic and wild animals including poultry, swine, cattle, rodents, and pets such as tortoises, turtles, chicks, dogs and
cats. Human patients, convalescent carriers, and mild and unrecognised cases also act as a reservoir.

The incubation period for Salmonellosis is commonly 12-36 hours, but can vary from 6-72 hours or longer. In human cases of enterocolitis, faecal excretion of the organisms usually persists for several days or weeks following the acute phase of the illness.

Although studies of experimentally induced Salmonellosis in human volunteers indicate that large innocula of Salmonellae are required to induce illness, typically \( >10^8 \) organisms, evidence from actual outbreaks suggests that the infective dose is often lower. Blaser and Newman (1982) studied the infective dose involved in outbreaks of human Salmonellosis and found that the ingestion of an estimated dose of \(<10^3\) organisms was involved in over half of the outbreaks reviewed.

3.2.2 Campylobacter

Campylobacters are Gram-negative, micro-aerophilic bacilli, with an optimal growth temperature of 42°C. The bacterial cells appear "vibrio" like because they are slender, spirally curved, non-spore forming rods.

Their unusual growth requirements in part explains why they were not routinely isolated in diagnostic laboratories until a selective medium was used in 1977 to improve their isolation. Since this time, their role as the commonest cause of gastroenteritis within England and Wales has been recognised (Skirrow 1977)(Pearson 1992).
Two species, Campylobacter jejuni and Campylobacter coli are the principal cause of Campylobacter enteritis in man. Other species, including Campylobacter lari, Campylobacter upsaliensis, Campylobacter fetus, Campylobacter hydointestinalis and Campylobacter conciscus have occasionally been isolated.

Campylobacters are now recognised to be a leading cause of acute bacterial gastroenteritis in many developed countries, including the United States, Japan and the United Kingdom.

They are widespread in the environment and often found in the intestinal tracts of many animals including swine, cattle, sheep, cats, dogs, other pets, rodents and birds including poultry. Known sources of infection, therefore, include under-cooked chicken and meat, unpasteurised milk and water contaminated with animal or bird faeces. The organism may also be ingested after contact with infected pets, wild animals or infected infants, all of whom may act as a source of cross-contamination to foods subsequently eaten uncooked and/or kept under inadequate refrigeration.

Campylobacters are not particularly hardy in food or in the environment and are rapidly killed during cooking. However, only a low infective dose, often $5 \times 10^2$ organisms per gram, is necessary in order to produce the disease (Robinson 1981). This arises because multiplication of the organism occurs in the gastrointestinal tract. Cross-contamination from raw poultry and meat to cooked food is, therefore, one likely means of disease transmission, since even if only a few organisms are involved this may be sufficient to cause infection.
The illness, which presents between two and ten days after exposure, is an acute enteric disease of varying severity. It is characterised by profuse watery diarrhoea, often accompanied by abdominal pain, malaise, fever, nausea and vomiting. In some 25% of patients, the symptoms, particularly abdominal pain, recur.

Although normally self-limiting within 1-7 days, a prolonged illness can occur in up to 20% of patients, particularly adults (Blaser et al, 1979). Liquid, foul-smelling stools containing blood in association with mucus and white blood cells is a common feature and during the infection untreated individuals may excrete the organisms for 2-7 weeks. A chronic carrier state in humans is unusual. However, among animals and poultry a chronic carrier state can become established and these represent a primary source of infection.

Campylobacter infection has a seasonal incidence which follows a consistent national pattern, peaking in late May or early June, followed by a decline until the end of the year. This differs from Salmonella infection which shows a peak some eight to twelve weeks later (Pearson 1992).

Campylobacters are fastidious in their growth requirements and are susceptible to heat, so that they are normally destroyed by cooking procedures used to kill other enteric bacteria. Cross-contamination from raw to cooked food products is, therefore, thought to play a major role in the incidence of Campylobacter. As such a low infective dose
is involved, even a small amount of contaminated raw food left in the food preparation area could be sufficient to cause infection.

The most important method of protecting food safety is, therefore, to prevent cross-contamination and to ensure good temperature control during the handling, preparation and storage of food.

3.2.3 Yersinia Enterocolitica

Yersinia are Gram-negative, facultatively anaerobic, psychrotrophic, non-spore forming bacilli or cocco-bacilli. Man acts as an incidental host, Yersiniosis being primarily a zoonotic disease of wild and domesticated birds and animals.

Yersiniosis was virtually unknown to food microbiologists until the mid 1970s but is now recognised as a significant human pathogen in developed countries. Food vehicles have been implicated in a number of outbreaks.

Infection with Yersinia results in a variety of clinical symptoms. The typical manifestation is as a short lived, acute gastroenteritis with diarrhoea, abdominal pain, fever, sore throat, and occasionally nausea and vomiting. Diarrhoea is especially pronounced in young children. Other less common symptoms include headache, anorexia, arthritis, iritis, cutaneous ulceration, osteomyelitis and septicaemia. In most cases the symptoms are indistinguishable from other bacterial gastrointestinal infections.
The disease is the result of infection by either of two bacterial agents, Yersinia enterocolitica (Y. enterocolitica) or Yersinia pseudotuberculosis (Y. pseudotuberculosis). Infection with Y. enterocolitica predominantly manifests itself as an enterocolitis, whilst Y. pseudotuberculosis is more commonly associated with abdominal pain.

Infection is by the faecal-oral route, the variable incubation time typically being 24-36 hours following ingestion of a contaminated food source. In some cases this may be as long as 14 days.

The illness lasts from a few days to 3 weeks and untreated cases can excrete the organism for 2-3 months. A chronic carrier state may develop in a few individuals.

Not all strains of Yersinia enterocolitica are pathogenic. Although more than 50 serotypes are known, only three serotypes (0:3, 0:9 and 0:5) are normally implicated as pathogenic strains in the UK and other parts of Europe.

Yersinia is widely distributed in the environment and in animals. Pigs have been recognised as an important reservoir for serotypes pathogenic to man. Although common in the gastrointestinal tract of pigs, the organisms are often present in the tonsils and tongue. Good slaughter practices may, therefore, be an important means of control. The control of faecal and oral contamination during slaughter have been demonstrated
to lower the incidence of Y. enterocolitica on carcasses (Anderson et al. 1991).

Yersinia have been found in a wide variety of foods including milk, raw and cooked meats, poultry, fish, liquid eggs, salad and vegetables, mushrooms, soya bean products, salami, cream cakes, and dairy products. A recent survey of 520 food samples, from 6 major retailers in the UK, revealed Yersinia species to be present in 4.2% of the samples (Walker and Brooks 1993). Although none of the species were found to be pathogenic, Yersinia was found in 19% of fresh meat samples, 2% of fish samples, 2% of sandwich samples, 1% of cooked meat samples and 1% of milk and dairy product samples.

Milk has been the vehicle most frequently implicated in foodborne outbreaks. Although there is a strong association between Yersinia and pigs, only one outbreak, attributed to the handling of chitterlings, is known. There is, however, epidemiological evidence from Belgium which suggests that the consumption of raw pork is a significant risk factor associated with Y. enterocolitica infection (Tauxe et al. 1987).

Although Y. enterocolitica has a growth range of pH 4-10, it is acid sensitive and has an optimum growth range of pH 7-8. Under chill conditions growth is unlikely above pH 4.5. It is more resistant to high pH than other enteric bacteria and like Listeria monocytogenes is able to multiply at low temperatures (-2°C to 44°C). Its presence is, therefore, significant in foods that have undergone processing and are
stored under refrigerated conditions. It is able to grow at salt concentrations of up to 5%.

Studies in the United States of America indicate that some food poisoning outbreaks caused by Y. enterocolitica may have involved human carriers as source of transmission. In addition, there is evidence to suggest that the organism may be more resistant to heat than has previously been thought, having been isolated from high temperature short time (HTST) treated milk. The prevention of cross-contamination and strict temperature control are, therefore, important in the prevention of infection.

3.2.4 Escherichia coli

Although most strains are non-pathogenic, Escherichia coli (E. coli) is a part of the normal bacterial flora found in the large intestine of man and animals. The reservoir of the organism is, therefore, an infected persons, who is often asymptomatic.

The organisms are Gram-negative, facultatively anaerobic, non-spore forming bacilli which are commonly sub-divided into four principle groups :-

- enteropathogenic (EPEC)
- enteroinvasive (EIEC)
- enterotoxigenic (ETEC)
- enterohaemorrhagic (EHEC)
Enteropathogenic strains have been associated with outbreaks of acute diarrhoeal illness in newborn nurseries. These produce diarrhoea, nausea, and abdominal cramp.

Enteroinvasive strains cause disease localised primarily in the colon. Characteristically, they produce fever and mucoid, sometimes bloody diarrhoea. Pathological changes closely resemble those manifested by Shigella. Infected humans are the principle reservoir of EIEC.

Enterotoxigenic strains behave more like Vibrio cholerae in that they produce a profuse water diarrhoea without blood or mucus, abdominal cramping, vomiting, acidosis, prostration, dehydration and sometimes fever. The symptoms usually last less than 5 days.

A person who recovers from ETEC infection can continue to excrete the organism for several months. Studies in developing countries indicate that ETEC is often present in the faeces of asymptomatic human carriers. It is the most common cause of "travellers diarrhoea", accounting for some 60-70% of all cases. Symptoms commence between 12 hours to a few weeks after entering a developing country.

The enteroinvasive and enterotoxigenic strains commonly cause sporadic outbreaks of disease. Enterohaemorrhagic strains are responsible for bloody diarrhoea and colitis. Symptoms differ from those associated with Bacillary dysentery in that fever is less prominent and there is copious bloody discharge. One primary serotype 0157:H7 is commonly incriminated within the U.K. (Sockett et al 1993).
The major mode of transmission is by the faecal-oral route, normally by contaminated food, or fomites, although person to person spread has also been demonstrated. The incubation period varies, but is commonly 12 hours to 3 days.

3.2.5 Vibrio parahaemolyticus

Vibrio parahaemolyticus is a halophilic vibrio. Over 72 serotypes are known and pathogenic strains produce an illness characterised by watery diarrhoea and abdominal cramps, sometimes accompanied by nausea, vomiting, fever and headache.

Marine coastal environments are the organism's natural habitat. The infection is, therefore, normally acquired by the consumption of raw or inadequately cooked seafood, foods contaminated by raw seafood, or seawater. In most cases an infective dose of $>10^6$ organisms is required and, therefore, multiplication of organisms in the food is a common factor. The incubation period is normally 12-24 hours but can range from 4-96 hours. Person to person spread has not been established.

3.3 TOXIC BACTERIAL ILLNESSES.

3.3.1 Staphylococcus.

Staphylococcus aureus (S.aureus) is a Gram-positive, facultatively anaerobic, non-spore forming cocci, which secretes enterotoxins as it
multiplies in food. Eight serologically distinct types of toxin have so far been recognised and it is these that are the cause of Staphylococcal food poisoning.

The disease is characterised by an abrupt and sometimes violent onset, with severe nausea, cramps, vomiting and prostration, often accompanied by diarrhoea, sometimes with sub-normal temperature and lowered blood pressure. Mortality is rare, but the intensity of the symptoms may necessitate hospitalisation.

The enterotoxins are produced in food during active growth of the bacteria, which often occurs during storage. Each toxin is a single polypeptide chain which is resistant to many proteolytic enzymes and which can withstand boiling for up to 30 minutes. Once formed in food, the toxin activity may, therefore, remain intact despite further cooking.

Staphylococcal enterotoxin A (SEA) is associated with approximately 75% of outbreaks due to Staphylococcus. Staphylococcal enterotoxin D is the second most important cause of outbreaks.

Amongst the general population, some 15-20% of Staphylococcus aureus isolates from humans are enterotoxigenic. This is significant, because S.aureus is nearly always transmitted to food either directly or indirectly from a human source.
Foods commonly implicated with Staphylococcal food poisoning are cooked foods which are to be eaten cold. For example, processed meats and eggs. Enterotoxin production is more likely to occur when competing organisms are absent or reduced as is the case in cooked food.

One of the major problems with the control of Staphylococcus aureus food poisoning is the high carriage rate of the organism by human beings. This increases the risk of contamination by food handlers.

Keeping food at ambient or inadequate temperature before or after heating allows the formation of toxin which may not then be destroyed by normal cooking. Care is, therefore, vital in order to ensure that handling is minimised and that foods are kept refrigerated prior to cooking or serving.

3.3.2 Clostridium

Clostridia are Gram-positive, endospore-forming, obligately anaerobic bacilli. Two principal species are important in food related illness; Clostridium botulinum and Clostridium perfringens.

Clostridium botulinum

As Clostridium botulinum (C.botulinum) multiplies, proteinaceous neurotoxins are produced. These toxins are the most potent natural poisons known, seven distinct types (A-G) being recognised. Although Botulism in man is normally caused by types A, B or E, types F and G
have also been implicated. Toxin is formed as the organisms grow in food and is then absorbed after the food is ingested. It subsequently attaches to the neuro-muscular junction of affected nerves and prevents the release of acetylcholine. This results in muscular paralysis. In severe cases the paralysis can be profound, with death resulting within 24 hours, usually from respiratory failure.

The clinical manifestations of the illness are characterised by their association with the nervous system. Ptosis, visual difficulty, dry mouth and sore throat are often the first complaint. These symptoms are often followed by descending symmetrical flaccid paralysis. Vomiting and diarrhoea may be present initially, however, fever is absent unless a complicating infection occurs. Unless adequately treated, some 33% of patients may die within 3-7 days of onset.

Following consumption of the contaminated food, neurological symptoms usually appear within 12-36 hours, although sometimes this may extend to several days. The shorter the incubation period, the more severe the disease and the higher the fatality rate.

The disease is infrequent within the United Kingdom. The most recent outbreak, the largest ever recorded in the United Kingdom, was associated with the use of contaminated canned hazelnut puree in the production of yogurt in 1989. This incident involved a total of 27 cases, however, due to prompt treatment only one patient died. The infected yogurt was consumed in North-West England and North Wales.
Prior to this outbreak only 18 cases had been recorded between 1922 and 1989.

As Clostridium botulinum is strictly anaerobic, botulism is only associated with foods which provide anaerobic conditions. Clostridium botulinum spores are heat resistant, surviving for two hours in boiling water and are only killed under proper food processing conditions. If such conditions are not vigorously maintained, the spores may germinate, allowing vegetative cells to emerge, and subsequent growth releases toxin. Historically, botulism was associated with home preserved foods and vegetables. This source has decreased in importance, the disease now more commonly being associated with improperly processed canned meats, and traditionally fermented foods such as those made with contaminated vegetables. As there is no gas production, contaminated foods are all the more dangerous because they rarely show signs of deterioration.

The control of Clostridium botulinum in preserved foods is based on inhibition of the organism rather than its destruction, since a major property of its spores is their inherent resistance. Careful control of one or more of the following factors: pH, water activity, salt concentration and temperature control, is essential.

Fortunately, botulinum toxin is destroyed within a few minutes by boiling, so in products where adequate cooking is carried out before consumption any toxin present will be rendered harmless.
Clostridium perfringens is a Gram-positive, endospore forming, obligately anaerobic bacilli. Some five toxin producing types have been recognised. Type A is responsible for most typical food poisoning outbreaks, whilst type C is responsible for cases of necrotising enteritis.

The organism is commonly present in soil and the intestinal tract of man and animals, therefore, foods such as raw meats are frequently contaminated. When contaminated food is cooked, dissolved oxygen is driven off and this induces the organism to sporulate. If the food is not cooled rapidly, then spores germinate and vegetative cells multiply.

Following ingestion of the contaminated foods, the organisms multiply in the intestinal tract where enterotoxin is released, damaging epithelial cells on the villi tips. The absorption of glucose is inhibited, and this results in an efflux of Sodium and Chloride ions and water causing an excess of fluid movement into the gut.

Type C is a rare but often fatal haemorrhagic disease in which organisms adhere to the intestinal wall and produce a necrotising toxin which affects the mucosa and can lead to Gangrene, shock and severe toxaemia.
3.3.3 Bacillus Cereus

Bacillus cereus is a Gram-positive, facultatively anaerobic, endospore-forming bacilli. Two enterotoxins produced by the organism have been identified and these result in quite different clinical syndromes. One enterotoxin is heat stable causing vomiting, the other heat labile causing diarrhoea.

Bacillus cereus (emetic)

The infection is characterised by the sudden onset of nausea and vomiting, usually 1-6 hours after ingestion of the contaminated food. The infection generally persists for less than 24 hours and is rarely fatal.

Bacillus cereus is widely distributed in nature and is ubiquitously found in soil, milk, cereals, starches, herbs, spices and other dried foodstuffs. It is also found on the surfaces of meat and poultry, probably because of soil or dust contamination.

The organism grows at temperatures between 10°C and 48°C, but has an optimum growth temperature of 28-35°C. At optimum temperature the doubling time may be as short as 18-27 minutes.

The toxin produced by the organism is heat stable and can withstand a temperature of 121°C for 90 minutes.
The emetic syndrome is nearly always associated with the consumption of boiled or fried rice dishes and outbreaks have, therefore, commonly been associated with Chinese takeaway dishes incorporating rice. The events leading to such an incident have common features. Firstly, the presence of Bacillus cereus spores within the rice. These are heat resistant and are not always killed during the cooking process. Consequently, cooking selects spores having greater heat resistance. When the rice cools surviving spores germinate and vegetative cells grow rapidly if it is left at room temperature. Of the now large number of vegetative cells in the food, some may sporulate leading to toxin formation, especially if the rice is left for more than a few hours in a fairly warm atmosphere.

Strict refrigeration and temperature control procedures are essential in controlling the formation of enterotoxin.

Bacillus cereus (diarrhoeal)

This syndrome is characterised by the onset of abdominal pain, cramps, and diarrhoea some 6-16 hours after ingestion of the contaminated food. The infection generally persists for less than 24 hours. Foods involved in the diarrhoeal illness have been quite varied, ranging from vegetables and salads to meat dishes and casseroles.
3.4 OTHER EMERGING PATHOGENS

3.4.1 Listeriosis

Listeria monocytogenes (L. monocytogenes) is a small, Gram-positive, non-acid fast, diphtheroid-like, non-spore forming, round ended bacilli. It is aerobic, motile at room temperature and haemolytic, producing Beta-haemolysis on blood agar. In cerebrospinal fluid, the organism often appears coccoid or in pairs and is consequently sometimes mistaken for a Gram-positive coccus, especially the pneumococcus.

Five species of Listeria are currently recognised. Three of these, Listeria innocua, Listeria welshimeri, and Listeria seeligeri, are considered avirulent. The fourth species, Listeria ivanovii may produce disease under certain conditions, however, only L. monocytogenes is currently believed to be pathogenic.

The first confirmed report of Listeria infection in humans appeared in 1929, although an organism closely resembling L. monocytogenes was described as early as 1891. In 1929, the bacterium was isolated from 3 patients suffering with an infectious mononucleosis-like disease and soon after was established as a cause of meningitis. Subsequently, the bacterium has been isolated from a number of animal species and is widely present in the environment.

The most common result of contact with the organism amongst the healthy adult population seems to be a transient, asymptomatic carrier state.
Where Listeria acts as an opportunistic pathogen of the intestinal tract symptoms include nausea, vomiting and abdominal pain, usually before the onset of fever. This disease is most significant in pregnant women and immunocompromised individuals where it may result in a more serious infection. In pregnant women infection can occur at any time, but often takes place in the third trimester, the symptoms often accompanied by a flu-like illness, with chills, fever, back pain, headache, discoloured urine and in some cases pharyngitis, diarrhoea and pyelitis. Infection of the pregnant woman leads to infection of the foetus either via the transplacental route or during delivery.

Symptoms of Listeriosis in the new born commonly include respiratory distress, heart failure, cyanosis, vomiting, convulsions, mucus in stools, and refusal to drink.

Mortality varies considerably according to the syndrome manifested. Meningitis in immuno-suppressed patients is associated with the highest mortality typically between 12.5% and 43%.

Listeria monocytogenes is particularly significant in that it is widely distributed in the environment and is, therefore, a common contaminant of foodstuffs. It is also psychrotrophic, growing best at 30–37°C, although it also grows at temperatures as low as 4°C in milk, 0°C in sterile meat and it can withstand freezing. Whilst its growth is slow at 3–4°C, at 6°C the logarithmic phase of growth is reached within 5–11 days. Since it is able to grow at refrigeration temperatures its
presence is, therefore, particularly significant in cook-chill meals, ready to eat and pre-cooked meals.

The D value at 71.7°C is approximately one second, so approximately $10^{15}$ listeria cells per millilitre of raw milk are needed for the organism to survive standard pasteurisation. The organism can, however, grow within leukocytes in milk and under such circumstances the D value increases to five seconds. Survival of the pasteurisation process (15 seconds at 71.7°C) is possible provided the initial bacterial loading exceeds $10^3$ organisms per millilitre.

3.4.2 Aeromonas

Aeromonas is a Gram-negative, facultatively anaerobic, non-spore forming bacilli. The pathogenicity of Aeromonas species in human enteric infections is still controversial. Although it has generally been established that Aeromonas is pathogenic in children, this has not been the case in adults. Some studies have, however, revealed Aeromonas to be the sole pathogen in acute adult diarrhoea. In 1986 472 cases of gastroenteritis were associated with contaminated frozen oysters which had been stored at -72°C for 18 months (Abeyta 1986).

A variety of factors have been suggested as potential virulence factors and these include :- (1) heat labile and/or stable enterotoxins

(2) cytotoxins

(3) haemolysins
Two types of enteric illness are associated with Aeromonas. The most common results in diarrhoea and a mild fever which is similar to cholera. In young children vomiting may also occur. Less common is a dysentery like illness which is characterised by diarrhoea and the presence of blood and mucus in stools.

Patients with Aeromonas related enteric illness usually produce mild, self limiting diarrhoea of one to seven days duration. There have, however, been cases where symptoms have continued for several weeks.

Three principal species, Aeromonas hydrophila, Aeromonas sobria, and Aeromonas caviae have been implicated in sporadic cases of food poisoning rather than with large scale outbreaks. As an "emerging" type of food related illness it is likely, however, that Aeromonads were not recognised or not looked for in some reported outbreaks of unknown aetiology. Aeromonas species have been found to be present in many foods including raw meat, poultry and fresh vegetables and since many strains are psychrotrophic they have the potential to multiply to high numbers even in refrigerated foods. They are, however, relatively heat sensitive organisms and heat processing and/or cooking is usually effective in destroying the bacteria.

3.4.3 Enterococcus faecalis

Enterococcus faecalis (previously Streptococcus faecalis) is one of the Lancefield group D streptococci commonly implicated in urinary tract and wound infections, intra-abdominal abscesses and endocarditis. The
organism has been implicated in food poisoning and causes classical symptoms such as diarrhoea. Despite this, no enterotoxin or other mechanism of enteropathogenicity has been identified.

Although very few outbreaks have been reported, the incubation period generally ranges from two to 48 hours, with diarrhoea being the predominant symptom. Nausea and vomiting may also occur.

A number of different foods have been implicated, however, dairy products, eggs, meats and salads are the most common.

Enterococcus faecalis is present in the gastro-intestinal tract and this makes it difficult to differentiate between commensal enterococci and suspected pathogenic enterococci in cases of food poisoning.

Enterococcus faecalis is significant in that it can survive heating at 60°C for 30 minutes and grows over a temperature range of 10-45°C. Some strains are able to grow at 4°C.

3.4.4 Plesiomonas

Plesiomonas are Gram-negative, facultatively anaerobic, non-spore forming bacilli. As with Aeromonas, there is some controversy surrounding the enteropathogenicity of Plesiomonas shigelloides, which has been implicated as an opportunistic pathogen rather than a specific cause of gastroenteritis in healthy individuals. The organism is present in up to 5% of the healthy population.
The organism is non-invasive, but enterotoxin activity has been demonstrated. Only a few outbreaks of P. shigelloides food poisoning have been reported. The incubation period was commonly less than one day but occasionally as long as two days. Symptoms of the infection include diarrhoea, abdominal pain, nausea and, less commonly, fever, headache and vomiting.

Plesiomonads are aquatic bacteria and are generally found in fresh and brackish water. In the small number of cases that have occurred in England and Wales there is some association with the consumption of foods of aquatic origin, including fish, crabs and oysters.

All strains of P. shigelloides are heat sensitive and are readily killed by heating at 60°C for 30 minutes. Some strains are able to grow at 8°C.

3.5 DISCUSSION

Bacteria require suitable combinations of water, nutrients, temperature and pH in order to survive and multiply. The inherent properties of the food, including pH, water activity, nutrients available and its temperature determine whether and which bacteria can multiply. The safety and shelf life of food can, therefore, be protected by the manipulation of these factors. This control has formed the basis of food preservation techniques for many years.
The incidences of the bacterial illnesses reviewed in this chapter are discussed in Chapter 6. In some 10-15% of all outbreaks of food related illness no causative agent can be identified. It is, therefore, possible that some of these cases may be the result of hitherto unknown agents. Campylobacter, now the commonest reported cause of gastrointestinal illness in England and Wales, was not routinely isolated until the 1970s, when improved laboratory techniques became available. Inadequate or inappropriate laboratory techniques may, therefore, mean that even known bacterial or viral pathogens are not isolated. Some existing pathogens such as Aeromonas, Plesiomonas, Yersinia, Enterococcus and Listeria may have a greater incidence than currently reported and may, therefore, be more significant than thought at present.

Knowledge of such pathogens is also important in identifying whether they are likely to exploit new niches created by new products and changes in food industry practices. For example, wider use of vacuum packing, modified atmosphere packing, and sous-vide provide new environments which may be exploited by existing pathogens such as Clostridium. Cook-chill, cook-freeze and food display operations provide niches which may be exploited by psychrophilic bacteria such as Yersinia, Aeromonas, and Listeria. Abuse of temperature controls in such systems also provides the opportunity for other pathogens to exploit these niches.
3.6 REFERENCES


4.1 INTRODUCTION

In many general community outbreaks of food related gastroenteritis within the UK, no bacterial agent can be identified. The CDSC regularly estimate that some 10-15% of outbreaks reported to it fall into this category.

Viruses have long been suspected as the cause of a number of these outbreaks, but it is comparatively recently that laboratory techniques have advanced sufficiently to enable them to be positively identified. Techniques for isolating viruses are far more complex and time consuming than those used for bacteria. Electron-microscopy, the most widely applicable technique for detecting viruses, has a limited level of sensitivity and requires $10^4-10^7$ viral particles per gram of specimen for detection. Since the infective dose for some viruses may be as low as 10 to 100 particles per gram (Iverson et al 1987) and since some viruses are likely to be present in such large numbers for only the first day or so of the illness, positive identification can be difficult. Nevertheless, in the last 20 years several viruses have been identified as causes of gastroenteritis (Blacklow and Greenberg 1991).

Although the role of viruses in gastroenteritis remains the subject of investigation electron microscopy of faeces from patients with gastroenteritis has shown a number of different viruses to be involved. Attempts to culture many small viruses associated with gastroenteritis
have been unsuccessful and this has led to a rather unsatisfactory system of nomenclature based on morphological appearance or geographical origin.

Caul and Appleton (1982) described an interim scheme for the classification of small round human faecal viruses which form sub-divisions into two broad morphological groups, structured viruses and featureless viruses (Table 4.1).

Unlike bacteria, viruses do not multiply in food. It would, therefore, be expected that viruses found most frequently within the population would also be those involved in food associated outbreaks. Reports to CDSC, however, indicate that rotaviruses consistently account for some 80% of cases, adenoviruses 12%, and that small round structured viruses (SRSV) are less frequently reported. In food associated outbreaks, where a viral cause was suspected and a positive identification of a virus found, some 90% were due to SRSV.

The principal viruses involved are discussed in order of their importance with regard to food associated gastroenteritis.

4.2 SMALL ROUND STRUCTURED VIRUSES (SRSV)

A viral cause for acute gastroenteritis was first identified in an outbreak in Norwalk, Ohio, USA in 1968. Other agents morphologically similar to the Norwalk virus have subsequently been isolated and these have been named after the regions in which they were first identified,
Table 4.1  A nomenclature scheme for the classification of small round structured viruses

<table>
<thead>
<tr>
<th>Morphology</th>
<th>Virus Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structured particles</td>
<td>Ren手持 Markdown text.</td>
</tr>
<tr>
<td>i) Classical surface structure 5-6 pointed star</td>
<td>Astrovirus</td>
</tr>
<tr>
<td>Stain-filled cups</td>
<td>Calicivirus</td>
</tr>
<tr>
<td>ii) Amorphous structure lacking geometrical symmetry</td>
<td>(Norwalk</td>
</tr>
<tr>
<td></td>
<td>(Hawaii</td>
</tr>
<tr>
<td></td>
<td>(Montgomery county</td>
</tr>
<tr>
<td></td>
<td>SRSV (Snow Mountain agent</td>
</tr>
<tr>
<td></td>
<td>(Taunton agent</td>
</tr>
<tr>
<td></td>
<td>(Amulree agent</td>
</tr>
<tr>
<td>Featureless particles</td>
<td>(Cockle agent</td>
</tr>
<tr>
<td>No resolvable surface structure and a sharply delineated outer edge</td>
<td>SRV (Wollan agent</td>
</tr>
<tr>
<td></td>
<td>(Ditchling agent</td>
</tr>
<tr>
<td></td>
<td>(Parramata agent</td>
</tr>
</tbody>
</table>

Source: Caul and Appleton 1982
eg Hawaii agent, Snow Mountain agent, and Montgomery County agent. In the UK, these viruses are classified according to their morphological appearance under electron microscopy and the group are generally referred to as small round structured viruses (SRSV).

SRSV infection usually presents as a self-limiting, mild to moderate disease that often occurs in outbreaks with "flu-like" symptoms, as well as nausea, vomiting, diarrhoea and abdominal pain. Projectile vomiting is a prominent feature and can occur without diarrhoea. The incubation period is typically 24-48 hours, and gastrointestinal symptoms normally resolve spontaneously within a further 24-48 hours. The illness has often been referred to as "winter vomiting disease", although outbreaks are also reported during the summer months.

The incubation period which is thought to be dose dependent is relatively long and, therefore, the consequent late onset of vomiting behaviour is probably the most important distinguishing feature as compared to bacterial gastroenteritis. The attack rate is usually high, in some cases over 80% of those exposed developing symptoms. Patients may be infective for up to three days after onset.

Gastrointestinal viruses tend to be highly infectious with as few as ten virus particles sufficient to induce infection. Unlike many bacterial causes of food poisoning such as Salmonella and Campylobacter, animals are not a source of SRSV. Infection is always ultimately from another human.
4.3 ROTAVIRUS

Rotaviruses are reovirus like particles of approximately 70nm diameter, with a wheel like shape and a double shelled capsid structure.

There are at least four serotypes of the human rotavirus, which is associated with 50% of hospitalised cases of diarrhoeal illness in infants and young children worldwide and 25% of cases in this group overall.

Rotavirus causes a severe gastroenteritis of infants and young children characterised by diarrhoea and vomiting. Secondary cases among family contacts are rare. Complete recovery usually occurs within two to three days and deaths due to the infection are normally the result of dehydration.

Infection is thought to be faecal-oral and possibly faecal-respiratory. Transmission via faecal contamination of food is thought to occur, but no specific foodstuffs have been implicated. The incubation period is 48 hours and in institutional outbreaks is characterised by a large scale sudden onset of symptoms usually of short duration.

4.4 ASTROVIRUS AND CALCIVIRUS

These viruses are considered to be less pathogenic in adults than those belonging to the Round Structured Virus group (RSV).
They were first described in 1978 and are 28-30um in diameter, with a characteristic five/six pointed star shaped surface pattern. Their nucleic acid type is single stranded RNA. At least five serotypes have been recognised within the United Kingdom.

Although they are difficult to cultivate in-vitro, Astroviruses have been detected in normal and diarrhoeal faeces from animals and humans. Few outbreaks of gastroenteritis in adults, involving astrovirus infection, have been reported. They are more common among school children and in paediatric wards.

4.5 TRANSMISSION

The main modes of transmission are the primary or secondary contamination of food and water, the faecal-oral route, or by aerosols. Primary contamination of food may arise at the time of production, secondary at the time of preparation. The food is thought simply to be a vector for virus transmission. Viruses do not grow or multiply in food, and, therefore, temperature control is of little relevance when considering suitable methods of prevention.

4.5.1 Primary contamination

The only convincing and unequivocal evidence for primary contamination relates to molluscan shellfish, including oysters, mussels, cockles, clams and scallops. SRSVs are the commonest cause of gastroenteritis associated with shellfish (Appleton 1990).
Shellfish are ideal candidates for primary contamination in that they grow naturally, or are cultivated in in-shore coastal waters which are often contaminated by human sewage from outfall pipes. They filter feed, concentrating faecal bacteria and viruses from the water during the process. In this way, concentration by three orders of magnitude, compared to levels in the original seawater, may occur.

Various treatment processes have been developed over the years in an effort to render shellfish safe for human consumption, however, these methods, generally successful in reducing bacterial contamination, may not have the same effect on viral contamination. For example, cockles and mussels are normally subject to heat treatment before consumption. Cooking times and temperatures are based on the destruction of bacterial contamination. The current Ports of London Health Authority Regulations require that the temperature at the centre of the flesh should reach 90°C and be maintained for 90 seconds. It is not known how effective this is in inactivating SRSV's and since the viruses cannot be cultured, conditions for their inactivation cannot be readily determined.

Decontamination of shellfish is also undertaken by depuration. During depuration, shellfish continue to feed and respire normally and at the same time element their bacterial load within 24-48 hours. Viruses, however, do not appear to respond to depuration and are not, therefore, removed.
It is not surprising, that eaten raw, shellfish such as oysters have been associated with 68% of all outbreaks of illness due to molluscan shellfish (Appleton 1990).

Although there is no clear documented evidence that primary contamination of vegetables has been responsible for outbreaks of viral food poisoning, vegetables have the potential to act as primary contaminated food products. They may, for example, be exposed to surface contamination from polluted water or sewage sludge. Katzenelson and Mills (1984) demonstrated that virus particles may be assimilated by plants from contaminated soil via the root to the body of the plant and Ward and Irving (1987) demonstrated that lettuce, the basic ingredient of most salad dishes experimentally provided particularly good survival times for a number of viruses. It is interesting to note that salad dishes feature in approximately 50% of reports of food associated viral infections in the United States of America. Although the majority of these are almost certainly due to secondary contamination during washing and preparation, it is possible that primary contamination may be responsible in some cases.

4.5.2 Secondary contamination

Secondary contamination of food by infected food handlers can take place during preparation or serving. There are a number of documented cases where this has occurred, for example in 1984, a baker in the United States of America continued to prepare confectionary whilst suffering
from diarrhoeal illness and was ultimately responsible for over three thousand reported cases of gastroenteritis (Kuritsky et al 1984).

Faecal/Oral Route

Viruses are commonly detected in stool samples from post-symptomatic cases for some 48 hours after the victim becomes symptomless. This together with the survival ability of virus particles, particularly in moist environments illustrates the potential danger of faecal/oral transmission.

Aerosols

One very significant feature of viral gastroenteritis is the potential for the action of vomiting to allow the release of millions potentially infective virus particles in the form of a fine aerosol spray. This is particularly alarming since the main characteristic of certain types of viral food poisoning is uncontrolled, sudden onset projectile vomiting. There is clearly, therefore, the potential for the contamination of unprotected foodstuffs, kitchen work surfaces and equipment, changing rooms and toilets by infectious airborne virus droplets, and the potential spread from vomiters to close contacts is, therefore, substantial.
4.6 DISCUSSION

Important factors that distinguish viral food related illness are its transmission by aerosol spray and its low infective dose. Since SRSV infection is characterised by late onset vomiting, food handlers may still be working whilst the infection is incubating. There is, therefore, clearly a high potential for virus transmission to foodstuffs. Since only a low infective dose is required, it is not surprising that food is an important vehicle for transmission, particularly in outbreaks associated with restaurants and receptions. Indeed, SRSV is the main cause of food related viral gastroenteritis in the UK (Riordan 1989).

The management of outbreaks is problematic because it is difficult to identify the food vehicles and source responsible and because SRSV is particularly infectious.

4.7 REFERENCES


Riordan, T., 1989. Virus gastroenteritis. PHLS Microbiology Digest, 6, 130.

5.1 CRYPTOSPORIDIUM

Cryptosporidium is a genus of protozoa pathogenic to man and other animals. Infection is the result of the ingestion of a small number of oocysts typically 4-6um in size. These subsequently form banana shaped motile sporozoites, which when released in the small intestine adhere to enterocytes of the villi and develop into trophozoites beneath the cell membrane. Fertilization of macrogametes may follow resulting in the production of oocysts, which in turn release sporozoites into the host intestine causing re-infection of the host.

Cryptosporidiosis presents as a diarrhoea of 2-14 days duration, sometimes accompanied by an influenza like illness and fever. Additional features include nausea, vomiting and abdominal pain usually following an incubation period of between 4 and 14 days. In immunocompromised or immunodeficient patients, more severe symptoms of diarrhoea, malabsorption and weight loss are common. The symptoms are less severe in children and the illness is usually self-limiting.

The foodborne transmission of cryptosporidiosis has only recently been suggested and there are no reported figures for the incidence of this type of food poisoning. Although until recently considered a zoonotic disease involving cattle and other farm animals, person to person transmission is well established and food transmission is thought
possible via untreated milk, processed meats and the contamination of drinking water used in the preparation of food.

Oocysts are destroyed by heating and freezing, although they may be resilient to many disinfectants, including chlorine. Pasteurisation of milk, however, renders them non-infective.

5.2 GIARDIA

Giardia intestinalis (synonyms Giardia lambila and Giardia duodenalis) is a well recognised worldwide cause of diarrhoeal illness and is the commonest parasitic gastroenteritis of man in the western world (Sehgal and Mahajan 1991).

Only a few viable cysts, perhaps even one, need to be ingested in order to cause infection (Rendtorff 1979). When mature, the cyst is approximately three hundred times larger than SRSV's. The life cycle is remarkably simple. After ingestion, trophozoites emerge in the small intestine and divide by binary fission. They then adhere to the intestinal wall of the host, producing a toxin like protein which induces diarrhoea.

Several routes of transmission have been documented including person to person, waterborne and foodborne. Most reported common source outbreaks are the result of waterborne or person to person spread, but restaurant associated cases have also been reported (Quick et al 1992).
Symptoms of Giardiasis include diarrhoea, steatorhoea, often with nausea and abdominal pain. Vomiting and the presence of fever are rare. The incubation period is usually 1-3 weeks following the ingestion of contaminated food. Infection is normally self-limiting after a period of a few weeks.

Asymptomatic patients excrete the cysts intermittently, often in low numbers (Rentdorff 1979) and, therefore, food handlers could present a potential source of transmission. It is not yet established within the UK whether Giardia is transmitted predominantly by water, human contact or whether it is a zoonoses.

Normal cooking procedures will kill any infective oocysts present, however, raw food and cross-contamination are hazards, especially when there has been contact with faecal contaminated water. Good personal hygiene practices also help to prevent direct faecal contamination of foods.

In the UK, Giardia is rarely implicated in large outbreaks and is usually reported from unconnected family or other groups.

5.3 DISCUSSION

There is evidence of food related illness as result of contamination from infected food handlers (Tully 1993). Whilst Giardia outbreaks may partly be obscured by a long incubation time, asymptomatic infections and lack of recognition of outbreaks, the risk from food related
infection is probably low. Nevertheless, the extent to which Cryptosporidium and Giardia are spread via food is not yet fully understood.

5.4 REFERENCES


CHAPTER 6 THE INCIDENCE AND COSTS OF FOOD RELATED ILLNESS

6.1 INTRODUCTION

The development of a coherent and effective food safety policy requires accurate epidemiological data as a basis from which objective policy decisions can be made and the effect of these decisions monitored.

Systems for monitoring infectious diseases within England and Wales have developed over many years. Diseases of public health significance in the 19th Century such as Cholera, Plague and Typhoid, have reduced in incidence as better facilities for water purification, sewerage treatment and refuse disposal have been provided. Other infectious diseases, such as Tuberculosis and Poliomyelitis, have also declined in incidence following the introduction of mass vaccination programmes and in the case of Tuberculosis with the introduction of a requirement for the heat treatment of milk for human consumption.

The effects of food poisoning were relatively insignificant, compared to the levels of mortality and morbidity caused by these diseases. It is, therefore, not surprising that the information collected by the principal historical monitoring system provides limited information concerning food poisoning. For example, the system does not distinguish between different types of food poisoning and does not identify the source.
The principal food related illnesses in England and Wales, their sources and causes, were reviewed in chapters 3, 4, and 5.

The objectives of this chapter are to:

(a) Review the primary sources of information on outbreaks and sporadic cases of food related illness within England and Wales,

(b) Discuss the changes that have occurred and the possible explanation for these changes, and

(c) Detail the incidence of food related illness in the community and identify the costs associated with these levels of infection.

6.2 SOURCES OF EPIDEMIOLOGICAL DATA IN ENGLAND AND WALES

Office of Population Censuses and Surveys (OPCS)

The Public Health Control of Disease Act 1984 (HMSO 1984) sets out statutory duties and powers for the control of diseases within the community. The Act requires registered medical practitioners to notify the "proper officer" of the local authority when they become aware or suspect that a patient they are attending is suffering from a notifiable disease. The Act specifies five notifiable diseases, however, a further twenty-eight are made notifiable under the Public Health (Infectious Disease) Regulations 1988 (HMSO 1988). These include Hepatitis A, Dysentery, and food poisoning. Although food
poisoning is not defined within the Act or regulations, guidance has been given as to what should be notified as food poisoning (DOH 1992).

Information detailing the age and sex of the infected person, the type of disease, and whether it was contracted at home or abroad is notified by the Local Authority to the OPCS on a weekly basis. Collated information is then published on a weekly, quarterly and annual basis.

This reporting is subject to a number of potential inaccuracies. For example, many patients are unlikely to present to their GP unless symptoms persist. In the event that they do, the doctor is often reluctant to notify an infection until it has been confirmed by a positive laboratory isolation. Without this, it is difficult to be sure that a person with diarrhoea and/or vomiting is suffering from food poisoning. Since this may not be done in every instance, it is probable that a substantial number of cases go unidentified and unreported.

Prior to the 1992 definition of food poisoning, infections due to Listeria and Campylobacter were not routinely notified unless there was definite proof that they resulted from the consumption of food. Conversely, notification of a case of food poisoning can now take place even though the cause of the illness may not have been traced to a food source. Where the doctor does notify the proper officer, subsequent investigation by the local environmental health officer may identify a food source and allow the cause of the case to be established.
Information collated by the OPCS does not identify the microbiological causes or the food sources involved. Data from this formal notification procedure is, therefore, limited. It does not distinguish between different types of food related illness, is dependant on the willingness or otherwise of some GPs to notify cases, is influenced by the level of public awareness of food safety, and it can be influenced by administrative changes.

Nevertheless, the OPCS statistics provide a valuable overall indicator of the underlying incidence of food poisoning dating back to 1949.

Communicable Disease Surveillance Centre (CDSC)

Isolation of micro-organisms causing infectious gastroenteritis, together with other foodborne pathogens such as Listeria are notified to the CDSC by the Public Health Laboratory Service and the Royal College of General Practitioners (RCGP). These reports are collated and analysed by the CDSC, but the information does not routinely identify a source of microbial infection and many cases may be spread by person to person, or may be contracted abroad.

Public Health Laboratory Service (PHLS)

Cultures of Salmonella types isolated from human sources by the Public Health Laboratory Service, National Health Service, private laboratories and the State veterinary Service are referred to the Division of Enteric Pathogens (DEP) at the Central Public Health Laboratory. This acts as
a national reference centre for Salmonellas and undertakes detailed identification of Salmonella species.

The Food Hygiene Laboratory also at the Central Public Health Laboratory acts as a national reference centre for Clostridium botulinum, Clostridium perfringens, Staphylococcus aureus, Bacillus cereus and other Bacillus species.

Surveillance of Listeriosis is undertaken by the PHLS as a joint activity between the CDSC and the Division of Microbiological Reagents (DMR) of the Central Public Health Laboratory. Strains of Listeria monocytogenes are sent to DMR for confirmation and subtyping. Case identification has been enhanced since 1983 by a regular exchange of data between CDSC and DMR.

In addition to Public Health Laboratory reported data, CDSC has its own surveillance systems established for specific projects. These schemes are triggered by the routine laboratory reporting systems, so that on receipt of a laboratory report more detailed information can be obtained.

Royal College of General Practitioners

A Sentinel practise scheme set up in 1966 and operated by the Royal College of General Practitioners Research Unit reports a wide range of diagnoses, including infectious intestinal disease. It is based on a disease index of first consultations. Some sixty general practices take
part in the scheme, representing a total of approximately 425,000 patients. Reports of clinical cases of infectious intestinal disease are made on a weekly basis. Reporting does not rely on microbiological confirmation of clinical diagnosis, but the scheme does enable the rate of GP consultation for infectious intestinal disease per head of population to be calculated. Therefore, it provides a means of identifying general trends. The data is published in the OPCS weekly monitor. A similar scheme is operated by General Practitioners in Wales.

State Veterinary Service (SVS)

The Zoonoses Order 1989 designates certain bacteria including Salmonella and Brucella as being a risk to human health. Anyone identifying the presence of such organisms in a bird or animal, their carcasses, products or surroundings is required to notify the State Veterinary Service. Data collected in this way is published in a quarterly "Update on Salmonella Infection" and in an annual animal Salmonellosis report.

Such data gives a picture of general trends, however, statistics are incomplete as the figures are highly dependent on the degree to which tests are carried out and to which notifications made.

Future developments

Whilst all of these reporting systems provide useful information, none are entirely successful in identifying the true incidence of food
related illness within the community, the nature of the micro-organism causing the infection and the possible food source. Richmond (1990) recommended a study of the incidence of infectious intestinal disease based on GP consultations in which there was microbiological confirmation of the clinical diagnosis. He considered that this would give more detailed information on the organisms most frequently involved in clinical cases of intestinal disease within the general population. It would also give an idea of the number of such cases in which an organism is not identified. He considered this necessary to enable the Government to have well founded data on the incidence of food poisoning caused by various types of micro-organisms. From this information it could then establish priorities to deal with them.

Subsequent to the recommendations of Richmond (1990), the Government set up an advisory committee (ACMSF) and a steering group (SGMSF), to consider the microbiological safety of food. These committees form the basis of the UK microbiological food surveillance and assessment system. The ACMSF is an independent expert committee providing advice to UK Health and Agriculture Ministers'. Its terms of reference are "to assess the risk to humans of micro-organisms which are used or occur in food and to advise the Ministers on the exercise of powers in the Food Safety Act 1990 relating to the Microbiological Safety of Food ".

During 1990-1992 the committee advised the Government on an appropriate definition of food poisoning, which would improve the reporting of cases, as a first step in improving the comparability of statistics across the UK.
The committee published two full reports in 1993 on "Vacuum packaging" (ACMSF¹ 1993) and "Salmonella in eggs" (ACMSF² 1993), and one interim report on "Campylobacter" (ACMSF³ 1993). The interim report contains 18 recommendations for Government, Industry and the consumer, many of which relate to research and surveillance. Surveillance recommended includes epidemiological studies on the incidence and transmission of Campylobacter in humans and the level of immunity within the community.

This surveillance is currently being carried out in studies funded by the DOH and MAFF.

The ACMSF have established two new working groups on Vero-cytotoxin producing Escherichia coli (VTEC), and on poultry meat. The VTEC group is assessing the risk of VTEC to human health and considering action which could be taken to reduce foodborne diseases associated with it.

The SGMSF, which is made up of experts from outside Government together with officials from the UK Agriculture and Health Departments, has the following terms of reference. "To identify through surveillance the need for action to ensure the microbiological safety of food".

The group is developing a surveillance strategy across the food chain through 5 working groups. These cover the areas of human epidemiology, farms/animals/abattoirs, food processing, retail/catering/consumer sectors, and research.
Pilot studies on human infectious intestinal disease, microbiological contamination of carcasses leaving abattoirs, cream cakes, flour confectionary, ready-to-eat meats, meat products, and self-service salad bars have been carried out.

The Department of Health is undertaking a major study of food poisoning to determine the extent and cause of intestinal disease in the community. The objectives are to:-

- Estimate the true incidence of Infectious intestinal disease (IID) within the population and in those patients consulting their GP.
- Identify the microbiological agents associated with IID.
- Determine possible factors that might be associated with a greater risk of becoming ill.
- Estimate the economic costs of such illness.

It is intended that this information be compared to that obtained under the current surveillance system.

6.3 FOOD POISONING STATISTICS

OPCS data

Figure 6.1 details the notifications of food poisoning made to the OPCS between the years 1949 and 1994. The figures for England and Wales show that the annual total of clinically diagnosed cases of food poisoning
Figure 6.1 Cases of food poisoning in England and Wales notified to OPCS 1949 - 1994

Source: OPCS 1994. * = Provisional Figures
has increased, the total for 1993 being approximately four times that
during 1983. Although there was a levelling out of reported cases
between 1989 and 1994, the rapid increase which occurred from 1980
continued in 1992, 1993 and 1994. Also significant, is the fact that
some 70% of these cases were acquired within the United Kingdom (OPCS
1994).

Salmonellosis

Laboratory reports to the CDSC of selected Salmonellae in human faeces
within England and Wales has risen from 10,768 cases in 1980 to over
30,000 cases in 1994 (Figure 6.2). In reality these figures probably
underestimate the actual number of cases, as many with mild symptoms are
unlikely to seek medical help. Even if they do, only a proportion are
likely to submit faecal samples for laboratory examination. Some will
also be asymptomatic and, therefore, unaware that they have the
infection.

During the 1980s two main epidemics can be observed (Figure 6.2). The
first, which took place early in the 1980s, was due to Salmonella
typhimurium. Reports of this serotype, which occurred primarily as
sporadic cases, rose from 3513 in 1980 to 6741 in 1983. This was
accompanied by a corresponding increase in the reported incidence of
S.typhimurium in cattle. The phage types from both humans and bovine
sources were similar. Meat and meat products were suggested as a
possible means of transmission (Sockett 1986), but there was also an
increase in milkborne outbreaks of S.typhimurium.
Figure 6.2 Laboratory reports of human Salmonella infection in England and Wales 1970-1994

Sources: Ađak 1994
Anon 1995

* = Provisional Figures
The second and continuing epidemic is due to the unprecedented increase of Salmonella enteritidis phage type 4 (S. enteritidis PT4), which began to emerge as a significant human pathogen in the mid 1980s. From the Spring of 1988 onwards, there was a marked increase in the reported incidence of foodborne S. enteritidis. By the end of 1988, this had superseded S. typhimurium as the commonest serotype in human infection. Between 1982 and 1992 the incidence of S. enteritidis rose from 1101 to 18928, whereas the incidence of S. typhimurium and all other serotypes remained little changed, dropping from 5337 to 4862 and from 5132 to 4862 respectively.

Although some patients with S. enteritidis Pt4 infection had a history of recent foreign travel, imported infections accounted for only a small part of the epidemic. In England and Wales, 47% of cases had a recent history of foreign travel in 1981, compared with only 13% in 1988.

Since infected food handlers are not usually a cause of foodborne Salmonellosis, unless remaining at work with acute diarrhoea (Cruikshank 1990), it is unlikely that infected food handlers played a significant part in the increase.

Veterinary data derived from reports under the Zoonoses Order showed a rise in the reported incidence of Salmonella typhimurium in cattle during the late 1970's and early 1980's. In fowl, however, this trend was different with a steep rise in the reported incidence due to S. enteritidis. This rose from zero in 1984 to 401 in 1988. There was,
however, little change in the trends observed over this period in other animal species.

Most of the reported incidents of S. enteritidis in fowl were of the invasive phage type 4 strain, which gave rise to higher than expected death rates in chicks.

Similar increases in S. enteritidis infection have also occurred in Europe, the USA, and other areas of the World (Rodrique 1990). S. enteritidis is the commonest serotype isolated in Austria, Bulgaria, Czechoslovakia, Finland, France, Germany, Hungary, Norway, Romania, Spain, and Switzerland (WHO 1992). A similar situation is also reported in Italy (Fantasia and Filetici 1994), Poland (Glonicka and Kunikowska 1984) and Argentina (Caffer and Eiguer 1984).

A six fold increase in cases of Salmonella occurred in the North East USA between 1976 and 1986. S. enteritidis exhibited a five fold increase in Spain between 1977 and 1984, and in Italy between 1982 and 1988 (St Louis et al 1988). It is reported by WHO (Anon 1990) that a large outbreak involving 1623 people occurred in the German Democratic Republic (GDR) in 1987. The outbreak was associated with the consumption of food prepared from raw eggs and the same phage type was isolated from the poultry farm where the eggs were produced.

A PHLS working party, set up in 1987, undertook an epidemiological study which indicated that the foodstuffs most commonly eaten by sporadic cases during the week before the onset of symptoms included egg
sandwiches, egg dishes and chicken. Two case control studies were undertaken in South Wales during June and July 1988 (Coyle et al 1988). These showed an association between S. enteritidis PT4 infection and the consumption of egg or egg products. The second, in August and September 1988 (Cowden 1989), demonstrated an association between S. enteritidis PT4 infection and eating any shop bought sandwiches containing mayonnaise or egg. There was also an association between illness and eating lightly cooked eggs or the consumption of ready prepared hot chicken.

Until 1987, the annual number of outbreaks of Salmonella due to S. typhimurium exceeded those due to any other single serotype, but in 1988 and 1989 S. enteritidis was responsible for over twice as many outbreaks as S. typhimurium.

Studies of the available data indicate that the increase in Salmonella infection has been due not only poultry meat, but also to the contents of intact hens shell eggs.

**Campylobacter**

Laboratory reports of human Campylobacter infection in England and Wales show a continuous increase since reporting began in 1977. A similar increase has also occurred in Scotland and Northern Ireland. The incidence of laboratory reports to CDSC of human faecal isolations in England and Wales is illustrated in Figure 6.3. The number of cases increased from 9,477 in 1980 to 44,315 in 1994.
Figure 6.3 Laboratory reports to CDSC of human Campylobacter infection in England and Wales 1980-1994

Sources: Adak 1994
Anon 1995

* = Provisional Figures
Some of the initial increase in laboratory reports may have been due to
the development of new tests and their wider availability. It is,
however, likely that the increase is real and may be associated with
infection in Poultry (Skirrow 1989). Indeed, laboratory reports
probably underestimate the true incidence of Campylobacter infection.
Kendall (1982) undertook a small study in a general practice, which
suggested that the annual incidence of Campylobacter infection within
the population was about 1.1%. If this figure is representative of the
population at large, it would suggest that over half a million cases of
Campylobacter occur each year in England and Wales. Such data is,
however, difficult to interpret because there are varying trends in
infection from year to year and in different parts of the country.
This makes simple extrapolation of the data unreliable. Similar studies
have suggested annual infection rates of 0.058% (Skirrow 1987) and 2.2%
(Sockett and Roberts 1989).

The most notable feature of Campylobacter infection during the 1980's
was its elevation to being the most frequently isolated bacterial
pathogen from cases of acute infectious diarrhoea in England and Wales.
Although the disease is recognised as a common cause of travellers
diarrhoea, only 10.0% of cases reported since 1989 have been associated

Outbreaks of Campylobacter are uncommon, although it is likely that many
go undetected. Some 228 were reported between 1984 and 1988, in which
82 involved food or water as a suspect vehicle. Only in 9 instances was
Campylobacter isolated from these sources, of which six involved raw or inadequately pasteurised milk.

Milk and poultry were the most common sources reported. Milk, particularly raw milk, is the most frequently reported food vehicle in outbreaks in England and Wales (Table 6.1). In Scotland, where the sale of raw milk was banned in 1983, this led to a reduction in the number of outbreaks associated with milk.

Cases have also been associated with the consumption of milk from bottles where the tops have been pecked by birds, particularly Jackdaws and Magpies (Hudson et al 1991).

Poultry is also a common food source. Between 30% and 100% of retail broilers may be contaminated with Campylobacter (Stern et al 1985), sometimes with large numbers of organisms (Hood et al 1988). Campylobacter can also be isolated from red meat, but the frequency is generally much lower, typically 1% (Stern et al 1985).

Outbreaks due to water are associated with drinking untreated or contaminated supplies. Other foods implicated include mushrooms (Harris et al 1986), fish (Fricker and Park 1989) and shellfish.

Yersinia

Figure 6.4 illustrates the laboratory reported incidence of gastrointestinal Yersinosia infection in humans in England and Wales.
Figure 6.4 Laboratory reports to CDSC of human Yersiniosis infection in England and Wales 1970-1994

Sources: Adak 1994
Anon 1995

* = Provisional Figures
Table 6.1  Food vehicles involved in outbreaks of human Campylobacter infection in England and Wales

<table>
<thead>
<tr>
<th>Years</th>
<th>Total reported/ identified</th>
<th>Number where a source was suspected</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Milk</td>
</tr>
<tr>
<td>1984 - 1988</td>
<td>228</td>
<td>85</td>
<td>38</td>
</tr>
<tr>
<td>1989 - 1991</td>
<td>1069</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1297</td>
<td>105</td>
<td>45</td>
</tr>
</tbody>
</table>

Source: Pearson and Healing 1992
between 1975 and 1994. Some 262 cases were reported in 1994. The explanation for the rise in the incidence during the late 1980s is unclear, but could be the result of closer scrutiny at the height of food safety scares. A similar increase which occurred in France, was attributed to vegetables contaminated by Yersinia enterocolitica in soil. The vegetables were then stored and distributed at temperatures of 4°-6°C. At these temperatures, the organism can multiply sufficiently to produce an infective dose (Mollaret 1984).

**Staphylococcus**

Cases of human faecal Staphylococcus aureus infection notified to CDSC between 1980 and 1989 are illustrated in Figure 6.5. During the last 20 years, Staphylococcal food poisoning has declined, both in terms of numbers of cases and of outbreaks. Between 1989 and 1991 some 25 outbreaks were identified, over half (16) being family as opposed to general outbreaks.

**Clostridium**

**Clostridium perfringens**

Clostridium perfringens is an important pathogen of man. Excluding Campylobacter, it was the second most frequent cause of reported food related illness in the UK during the 1980s. Figure 6.6 illustrates the incidence of infection in England and Wales between 1980 and 1989. Between 1989 and 1991 some 152 outbreaks were reported, of which 146
Figure 6.5 Laboratory reports of human Staphylococcus aureus infection in England and Wales 1980-1989

No of cases

Year


Source: Adak 1994
Figure 6.6 Laboratory reports of human Clostridium perfringens infection in England and Wales
1980-1989

Source: Adak 1994
were general outbreaks. Such outbreaks are commonly associated with large scale catering of the type found in canteens, schools, hospitals and institutions. The main problem arises from the advance preparation of large quantities of food, such as meat and meat dishes which are difficult to cool rapidly. Slow cooling allows rapid multiplication of the vegetative cells.

Clostridium botulinum

Reported cases of botulism in the UK are illustrated in Table 6.2. Between 1947 and 1989 only 5 incidents were reported. The incident in 1989 resulted from hazelnut yogurt and was the largest reported outbreak in the UK.

Home curing of ham and bacon was common in the UK between 1939 and 1954, with no obvious problem from botulism. Subsequently, home canning has almost completely been replaced by commercial canning. This has improved and tightened standards of control, and may account for the higher incidence of botulism in other countries where home canning is more common.

Vacuum Packaging (VP) and Modified Atmosphere Packaging (MAP) have been in worldwide use since the 1960s and 1980s respectively. Only 7 known outbreaks have been associated with these processes and none of these occurred within the UK. Nevertheless, such techniques have in general been applied within food manufacturing situations where high standards and appropriate control systems are in place. As the technology and
Table 6.2  Foodborne botulism in the U.K.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
<th>Number of deaths</th>
<th>Food Vehicle</th>
<th>C. botulinum type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>8</td>
<td>8</td>
<td>Duck paste</td>
<td>A</td>
</tr>
<tr>
<td>1932</td>
<td>2</td>
<td>1</td>
<td>Rabbit and pigeon broth</td>
<td>?</td>
</tr>
<tr>
<td>1934</td>
<td>1</td>
<td>0</td>
<td>Jugged hare</td>
<td></td>
</tr>
<tr>
<td>1935</td>
<td>5 ?</td>
<td>4 ?</td>
<td>Vegetarian nut brawn</td>
<td>A</td>
</tr>
<tr>
<td>1935</td>
<td>1</td>
<td>1</td>
<td>Minced meat pie</td>
<td>B</td>
</tr>
<tr>
<td>1947</td>
<td>5</td>
<td>1</td>
<td>Macaroni cheese</td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td>2</td>
<td>0</td>
<td>Pickled fish from Mauritius</td>
<td>A</td>
</tr>
<tr>
<td>1978</td>
<td>4</td>
<td>2</td>
<td>Canned salmon from U.S.</td>
<td>E</td>
</tr>
<tr>
<td>1987</td>
<td>1</td>
<td>0</td>
<td>Kosher airline meal</td>
<td>A</td>
</tr>
<tr>
<td>1989</td>
<td>27</td>
<td>1</td>
<td>Hazelnut yoghurt</td>
<td>B</td>
</tr>
</tbody>
</table>

Source: Gilbert, R.J., Rodhouse, J.C. and Haugh, C.A., 1990
equipment is now becoming more readily available to smaller businesses such as butchers shops, where the understanding of potential dangers and the degree of control over the operation may be less, there is the potential for system failures to occur.

Other changes in food processing such as extended life cook-chill, sous-vide catering, reductions in the use and level of nitrites in cured meats, and a tendency to use lower cooking temperatures to reduce loss of yield and improve colour and texture also have the potential to cause problems in the future.

Bacillus

Reported cases of Bacillus cereus infection in England and Wales between 1980 and 1989 are illustrated in Figure 6.7. The incidence of infection is not particularly high in comparison to Salmonella. In the period 1989 to 1991 some 58 outbreaks occurred, of which most (42) were general outbreaks.

Escherichia Coli (E.coli)

Strains of E.coli 0157 are isolated throughout the year, but show a peak incidence in the third quarter. Figure 6.8 illustrates the isolation of Vero Cytotoxin-producing E.coli 0157 between 1981 and 1994. A major increase is discernible in recent years. Roberts and Gross(1990) suggest that although increased reporting may contribute to this rise, there is evidence that the increase is real. In June 1992, 226 isolates were
Figure 6.7 Laboratory reports of human Bacillus cereus infection 1980-1989

Source: Adak 1994
Figure 6.8 Laboratory reports of human Vero cytotoxin producing E.coli O157 infection in England and 1981-1994

Sources: Adak 1994
Anon 1995

* = Provisional Figures
identified (Frost 1989). As in previous years, the two most common phage types isolated were PT2 and PT49. This represented the highest number of isolates recorded for any calendar month and was more than twice the number received during the same month in 1991. The explanation for such a large increase is not clear, since a general outbreak reported in that month accounted for only 21% of the isolates.

Listeriosis

Listeria infection is not a notifiable disease, but microbiological laboratories which isolate Listeria monocytogenes from infected patients notify the CDSC. It is, therefore, unlikely that serious cases of diagnosed infection go unreported.

Laboratory reported infections in England, Wales and Northern Ireland increased three fold during the 1980s. The level of infection reached a peak of nearly 300 in 1988 and then declined in 1989 and 1990. The number of reported cases between 1983 and 1992 is illustrated in Figure 6.9. Between 1983 and 1986 the incidence rose from 115 to 149 cases. In 1987, the number of cases rose sharply to 259, and continued to increase during 1988 and 1989 before declining in 1990 and 1991. The relatively sharp increase between 1987 and 1989 was associated with subtype 4bx which was also isolated from a large number of retail samples of meat pate (McLauchlin et al 1991).

The increase in reports during late summer and autumn reflects a pattern which was common prior to the upsurge between 1987 and 1989. This
Figure 6.9 Laboratory reports of human Listeriosis infection in England, Wales and Northern Ireland 1983-1992

Source: Adak 1994
increase was particularly associated with non-pregnancy cases. Reports of pregnancy associated cases were highest over the winter months. The reason for this phenomena is not known.

The serotype distribution in 1991 and 1992 was similar to that observed between 1983 and 1986, when 62-71% of isolates were identified as serotype 4. Between 1987 and 1989, this type accounted for some 77-86% of reports.

Newton et al (1993) concluded that the decline in the number of reports of Listeriosis and the changing epidemiological and clinical features observed in the UK during 1990 and 1991, were due to the disappearance of a common food source. The reduction followed warnings issued by the Department of Health in July 1989 about the risks from the consumption of pate by vulnerable groups (DHSS 1989). Government warnings in early 1989 concerning soft cheeses and cooked chill foods, together with increased vigilance by the food industry may also have contributed to the decline.

Most cases of Listeriosis have been sporadic, but common source outbreaks have been recognised. Foodstuffs have been implicated as vehicles of infection (Mclachlin et al 1991) (Linnan et al 1988).

**Aeromonas**

Human Aeromonas infections, of which some are attributable to food, increased from 96 in 1981 and peaked at 588 in 1987. Although this
level subsequently decreased, the incidence in 1994 was 664 (Figure 6.10).

**Plesiomonas**

Although the reported incidence of *Plesiomonas* infection has risen continuously since 1976, as illustrated in Figure 6.11, the annual incidence in 1994 was 63 and the proportion of these cases which were foodborne is unknown.

**Viral Illness**

The surveillance of gastroenteritis caused by SRSV is based on voluntary reporting of laboratory identifications to the CDSC. During 1990, some 90,000 cases involving gastrointestinal pathogens were reported by laboratories in England and Wales. Of these, 18% were identified as viruses. Some 2.5% of these virus identifications were SRSV. Figure 6.12 illustrates reports of viral gastroenteritis during 1994, the total number of reports being some 19,687.

There has been a rising trend in the reporting of SRSV during the last 10 years. Recorded identifications rose sharply from a low level in 1981 as the number of reporting laboratories increased. In 1986, the annual total of laboratory reports rose to 319. This represented an increase of 144 on the previous year. The upward trend in annual reporting has continued since. Outbreaks of suspected gastroenteritis between 1981 and 1990 are detailed in Table 6.3. The low positivity
Figure 6.10 Laboratory reports to CDSC of human Aeromonas infection in England and Wales 1981-1994

Sources: Anon 1994
* = Provisional figures
Figure 6.11 Laboratory reports to CDSC of human Plesiomonas infection in England and Wales
1975 - 1994

Sources: Adak 1994
Anon 1995

* = Provisional Figures
Figure 6.12: Laboratory reports of human gastrointestinal virus infections in England and Wales in 1994

Source: Anon 1995
Table 6.3  Outbreaks of suspected viral gastroenteritis reported to CDSC 1981-1990

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outbreaks</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>10</td>
<td>17</td>
<td>15</td>
<td>18</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Number affected</td>
<td>42</td>
<td>27</td>
<td>316</td>
<td>245</td>
<td>274</td>
<td>1641</td>
<td>846</td>
<td>766</td>
<td>160</td>
<td>429</td>
</tr>
<tr>
<td>Number tested</td>
<td>3</td>
<td>27</td>
<td>72</td>
<td>42</td>
<td>136</td>
<td>313</td>
<td>194</td>
<td>258</td>
<td>110</td>
<td>196</td>
</tr>
<tr>
<td>Number positive</td>
<td>3</td>
<td>-</td>
<td>14</td>
<td>12</td>
<td>28</td>
<td>56</td>
<td>41</td>
<td>74</td>
<td>37</td>
<td>47</td>
</tr>
</tbody>
</table>

Reference:  Adak et al 1991
rate is a reflection of the difficulty in identifying virus particles in faecal samples. SRSV was identified in only 25% of the samples tested following known outbreaks. Few family outbreaks of SRSV are reported to the CDSC and this differs markedly from most other gastrointestinal infections. Kapikian (1990), however, reports a number of family outbreaks within the United States.

SRSV's are readily spread from person to person and this was the suggested mode of transmission in a series of outbreaks affecting a 119 people aboard a cruise ship in 1986 (Ho et al 1989), in two hotel outbreaks affecting over 130 people in 1985 and 1986 and in an outbreak at a school in 1986 which affected 80 staff and pupils. Ho suggests that transmission is usually through aerosols and environmental contamination, both resulting from projectile vomiting. This is the most likely mode of transmission in outbreaks in hospitals and nursing homes.

Food is also an important vehicle of transmission, particularly in outbreaks associated with restaurants and receptions. Riordan (1989), reports SRSV to be the main cause of foodborne gastroenteritis in the UK. However, a food vehicle has been identified with certainty in only a few outbreaks.

Suspected vehicles are usually foods which have been handled but not subsequently heat treated. This was the case in a hotel outbreak in 1986 in which the food specific attack rate showed that melon was the likely source of infection (Iversen et al 1987). A similar outbreak in
1988 showed that fruit salad was the most likely vehicle of infection (Woodhatch 1990). Similar findings have been reported in the United States. Kuritsky et al (1984), reported an outbreak in Minneapolis affecting over 120 people, in which cake frosting prepared by an infected food handler was implicated as the vehicle of infection.

A number of outbreaks of gastroenteritis caused by molluscan shellfish contaminated with SRSV have been recorded, including one in London which was associated with the consumption of raw oysters (Gill 1983). In that outbreak, a total of 181 people were affected and four identifications of SRSV made.

The increase in laboratory reports of SRSV infection between 1980 and 1992 is, to a large extent, the result of increasing identification and reporting. Many of these cases of gastroenteritis would probably have previously been ascribed to other causes. Increased awareness of the importance of SRSV infection has led to an increase in the number of laboratories with the technical ability to detect viruses. In addition, more samples are referred for analysis by laboratories lacking these facilities. Regional differences are probably an indication of varying medical practice and technical expertise than of disease patterns.

Identification of SRSV as a source of infection is complicated by the limitations in detection. Electron microscopy is expensive, experienced personnel are required, and the techniques used are labour intensive and time consuming. Further, ten million morphologically intact virus
particles per gramme of faeces are required for detection. This number of SRSVs is only likely to be present in faeces during the first day or so of illness (Riordan 1989). Identification of SRSV, therefore, depends on a patient being sufficiently ill to consult a doctor within 24 hours of onset and further, for a faecal sample to be taken promptly and sent to an appropriate laboratory. Most fit adults would not consult a doctor unless the symptoms were severe or prolonged. Early samples fitting the above criteria are most likely to be taken from infants and the elderly who contract the disease in hospital, and from secondary cases and from cases who are part of an outbreak under investigation.

At present, it is difficult to estimate the proportion of cases of infectious gastroenteritis in England and Wales which is attributable to SRSV infection, or the importance of SRSV as a causative agent relative to other more easily identifiable pathogens.

Cryptosporidiosis

Although there are no reported figures for the level of foodborne Cryptosporidium infection, Figure 6.13 illustrates the laboratory reported incidence in human faeces in England and Wales between 1983 and 1994.
Figure 6.13 Laboratory reported cases of human Cryptosporidiosis infection in England and Wales 1983-1991

Year


No of cases

Thousands

Sources: Adak 1994
Anon 1995

* = Provisional Figures
Giardia

Whilst overshadowed by Cryptosporidium, the other principal protozoal pathogen in the UK, Giardia, is isolated from patients with greater frequency. Figure 6.14 details the laboratory reported incidence in human faeces between 1983 and 1994. Although foodborne outbreaks have been reported (Quick et al 1992), it is unclear how many cases result from this route of infection.

Vibrio parahaemolyticus

The incidence of Vibrio parahaemolyticus remains low in comparison to other food related illnesses (Figure 6.15). Sporadic cases between 1989 and 1991 numbered 69 of whom most (57), had a history of foreign travel.

6.4 THE COST OF FOOD RELATED ILLNESS

Comparatively few studies on the costs of foodborne disease have been published. Those that have, indicate that the true costs are high. Sockett (1991) suggests that the costs associated with Salmonellosis in the UK fall under two broad cost headings. Firstly, "public sector costs" and secondly, "costs to society".

Public sector costs are incurred as a result of the investigation of cases or outbreaks and the treatment of patients. These costs include those of environmental health departments, public health physicians,
Figure 6.14 Laboratory reports of human Giardiasis in England and Wales 1980-1994

Sources: Adak 1994
Anon 1995

* = Provisional Figures
Figure 6.15 Laboratory reports of human Vibrio parahaemolyticus infection in England and Wales 1980-1989

Source: Adak 1994
laboratories, the DOH, the MAFF, and the cost of providing medical services at general practice level or in hospital.

The costs to society are less easy to identify in financial terms. These include the cost of illness to the patient and their immediate family, and the cost to the national economy either as a result of absence from work or the association of a particular food product or outlet with an outbreak of food poisoning. The latter can have substantial repercussions for the producer, manufacturer or retailer.

Roberts (1991) estimated the tangible costs per case of Salmonella infection during 1988 and 1989 to be £789.00 per case in England and Wales. During this period, some 23,000 reported cases of laboratory confirmed and reported Salmonella infections occurred, resulting in a tangible cost of £18.1 million. No intangible costs were included within these figures. If costs incurred as the result of loss of life, are added to those arising from the proportion of cases that may develop chronic illness requiring long term treatment, this estimate could be substantially higher.

In a national study in 1988/1989 Sockett and Roberts (1991) estimated the annual cost of human Salmonella infection to be between £221 Million and £331 Million. If the costs of other food related illnesses, such as Campylobacter, are added, then the annual cost was probably double this amount.
Similar estimates of the cost of foodborne disease have been undertaken in the United States (Todd 1989a) and Canada (Todd 1989b). Todd estimated an average cost per case of $1,000. The total cost within the United States was, therefore, $8.4 billion. He also estimated the average cost per case by type of foodborne disease, including the Norwalk agent. Similar analysis of the cost of foodborne infections within the UK has not been carried out. Interestingly, however, the estimated cost per case of Salmonella within England and Wales (Sockett 1991) is consistent with the estimate for the USA and Canada (Todd 1989a) (Todd 1989b).

The cost per case estimated by Sockett (1991) relates to 1988 and 1989, and would be considerably higher in 1992. Further, if one considers the large number of mild and unreported cases of food related illness, this cost could be considerably higher. This view is supported by the few published studies on the financial implications of foodborne disease which suggest that the costs are high, and that the figures represent under-estimates.

The cost of foodborne infection within England and Wales is considerable, not merely from a financial point of view, but also in terms of mortality and morbidity. Roberts (1989) considered the benefits of secondary prevention, which act to limit an outbreak once it has happened. He studied an outbreak due to contaminated chocolate in 1982. This outbreak was stopped when only 20% of the product had been sold. The costs of the outbreak at the point it was stopped, compared to the projected costs of the outbreak had it continued until stocks of
the product were exhausted, indicated that for every £1.00 expended on investigation there was a saving of £3.50 to the public sector and £1.50 in lost production. The cost benefit of preventing secondary Salmonella infection was very favourable.

Cohen (1983) and Yule (1988) studied the potential economic advantages of primary prevention aimed at reducing initial product contamination. They concluded that financial benefits would result from a ban on the sale of unpasteurised milk in Scotland if this reduced milk associated Salmonellosis. Sharp (1988) has shown that milkborne Salmonella and Campylobacter infection is now almost non-existent in Scotland, following the introduction of such a ban in 1983.

6.5 DISCUSSION

In a survey amongst the general public in 1994 (FDF 1994), some 5% indicated that they had suffered food poisoning in the previous 12 months. If correct, this indicates that more than 2.5 Million cases of food related illness occurred in the UK in 1993.

Although the number of reported cases of food related illness is increasing (Fig 6.1), some question whether this increase is real and point to better awareness, reporting, and improved laboratory procedures as reason for the apparent rise in the number of cases.

Such factors undoubtedly affect the level of reported illness and, therefore, the actual prevalence of infection is now more accurately
reflected in official statistics than previously. The continued upward trend should not, however, be assumed to be simply a reflection of improved reporting. Donald Acheson the then Chief Medical Officer, in evidence given to the Social Services Committee on this matter in 1989, asserted "No one that I know would be prepared to accept the view that the majority of this increase is due to better reporting. There is undoubtedly a problem which is appearing in large numbers" (Social Services Committee 1989).

It is also argued that the majority of cases of food related illness do not result from retail or catering establishments. Certainly, an estimated 10% of reported cases are acquired abroad (Sockett et al 1993). However, some 70% of all general outbreaks result from the catering sector.

Whilst these figures provide a general guide, they must, however, be treated with some caution. It is difficult, particularly in sporadic cases, to confirm a specific catering or retail establishment as the source. It is also likely that outbreaks and sporadic cases, assumed to have arisen in the home, may in fact be wholly or partly the result of deficiencies in the distribution and retailing of food products. The increase in the number of reported cases of sporadic food related illness, which may in part result from undetected outbreaks, supports this view.

Pre-cooked, ready-to-eat meals and refrigerated products are particularly susceptible to bad practices such as temperature abuse.
during handling, storage and display. Retail sale of these products may contribute to the level of sporadic cases reported which cannot be readily traced to a particular establishment or product. There is, therefore, a need for a more detailed investigation of sporadic cases of food poisoning in order to provide greater information about the sources and causes of such cases.

A conservative estimate of the annual cost of human Salmonella infection in 1988/89 was £231-331 Million (Sockett and Roberts 1991). Given that cases reported are considered to represent only a proportion of the actual incidence, probably less than 10% (Eley 1992), the cost may be as high as £2.3-3.3 Billion at 1988/1989 prices. Even without additional costs due to inflation, this represents between 0.56% and 0.81% of UK Gross Domestic Product and between 3.2% and 4.5% of Gross Domestic Product of the Hotel, Catering and Distribution Industries in 1991 (HMSO 1992).

If the cost of other food related illnesses are added to this figure, including those due to Campylobacter, which has a greater annual incidence, then the annual cost may have been double this amount. This cost is largely unnecessary and represents an unacceptable burden on the nation.

There are, therefore, overwhelming economic reasons which provide a real incentive for a sound food safety policy and investment in activities designed to prevent or limit the incidence of food related illness.
6.6 REFERENCES


DHSS, 1989. Advice from the Chief Medical Officer; Listeriosis and Food. DHSS PL/CMO(89): 16 Feb.

DOH, 1992. Advice from the Chief Medical Officer; Definition of Food Poisoning. Letter PL/CMO(92)14: 21 September.


Riordan, T., 1989. Virus Gastroenteritis. PHLS Microbiology Digest, 6, 130.


CHAPTER 7  CAUSES OF FOOD RELATED ILLNESS

7.1 INTRODUCTION

The important pathogens involved in food related illness, their incidence and costs have been reviewed in Chapters 3, 4, 5 and 6. In this Chapter, the causes of these illness are considered, with particular emphasis on factors of importance to retail and catering operations.

7.2 MICROBIAL FACTORS

The microbial flora in food when it is eaten depends on the initial flora in the food or its ingredients, any processing that has taken place, any secondary contamination, the nature of the food and the conditions under which it has been prepared, transported and stored.

The initial flora is affected by primary contamination during harvesting and slaughter and substantial effort has been devoted towards excluding pathogens. For example, the eradication schemes for animal diseases such as brucellosis and bovine tuberculosis. Whilst these two diseases result in illness in the animals concerned, healthy animals may carry micro-organisms which are pathogenic in man. Although efforts continue to be made to minimise primary contamination with pathogens such as Salmonella, it seems unlikely, given the limitations of current technology, that all such pathogens can be eliminated from food. Indeed, it is questionable whether such an objective is more desirable
or cost effective than the application of well established food safety and preservation methods. In practice, current methods of intensive farming, transport, and slaughter do not prevent substantial dissemination of pathogens into the food chain.

Basic foodstuffs and ingredients used in catering operations must, therefore, be assumed to be "contaminated". Since such businesses could not continue without the use of these foods, careful time/temperature control is required during cooking to reduce or eliminate pathogens in the food. Such control is important throughout storage, preparation, cooling, reheating and service and is also essential during storage and display in retail establishments.

In addition to the potential hazards from the primary contamination of foods, secondary contamination of prepared foodstuffs may occur by cross-contamination from raw foods, or contamination with pathogens from an infected food handler.

For micro-organisms to grow, a suitable combination of water, nutrients, temperature and pH must be available. The safety of food can, therefore, be assured by careful control of these factors. In addition, other processing such as cooking and pasteurisation can kill, inhibit or remove pathogens from food. Processing failure can, however, lead to the survival of pathogens or their toxins which, if at a sufficient level, cause illness if the food is consumed. In addition, time/temperature abuse can result in the multiplication of micro-organisms in food.
The main factors which affect microbial growth in food are:

(a) Food substrate: Many pathogenic bacteria have complex nutritional requirements and, therefore, animal based products often provide an excellent growth medium.

(b) The pH of food: The type of acid and acidity affect the rate of microbial growth. The effect of acids interacts with those of water activity, temperature and redox potential.

(c) Water activity ($a_w$): The $a_w$ is a measure of the available water within a food. It may be reduced by increasing the concentration of solute in the aqueous phase of the food. Pathogens grow most rapidly in the $a_w$ range 0.995-0.980 (Christian 1980). Decreasing the $a_w$ generally results in a longer lag phase and a slower growth.

(d) Redox potential: The oxidation-reduction (redox) potential of a food is dependent on the nature of the atmosphere around the food, the access of the atmosphere to the food and the resistance of the food to change (Genigiorgis 1981). For example, anaerobes such as Clostridium botulinum require a reduced redox potential for growth.

(e) Temperature: The rate of microbial growth increases with temperature to an optimum temperature at which the growth rate is at a maximum. Micro-organisms grow over a wide range of temperatures, although until recently most pathogens were considered to have a growth range of 0-50°C, with the growth rate
being significantly reduced below 10°C. Low temperature pathogens initially considered to be of limited significance have now been identified. These include Listeria monocytogenes, Yersinia enterocolitica, Aeromonas hydrophila and Campylobacter. These pathogens are capable of competitive growth at low temperatures. Indeed, Campylobacter jejuni can survive for longer periods at 5°C than at 25°C or 37°C (Palumbo 1986).

Demand for more natural foods has, in the past decade, increased the use of chill temperatures to store food. Holding food at <5°C was viewed as an appropriate temperature to restrict bacterial growth (Palumbo 1986). It is clear, therefore, that strict temperature controls are required to restrain the growth of psychrophilic pathogens and even minor temperature abuse can increase the potential hazard.

(f) Concentration of gases in the environment: The effects of atmospheric composition on microbial growth are related either to the direct effects of the gases on the micro-organisms or to the associated changes in the redox potential. Thus, packaging of foods in controlled or modified atmospheres has an impact on the shelf life of the product.

7.3 PERCEPTIONS OF THE CAUSES

In January 1988, a survey commissioned by the Ministry of Agriculture Fisheries and Food (MAFF 1988) investigated the knowledge and perception
of various aspects of food poisoning and food hygiene amongst the
general public. The survey was based on a representative sample of
some 1927 adults, aged 16 and over, within England, Scotland and Wales.
The causes most commonly thought to infect food and to lead to food
poisoning are detailed in Figure 7.1.

The findings indicated some appreciation of the dangers associated with
poor temperature control of food. Some 53% of the sample indicated
inadequate thawing to be a cause of food poisoning. Similarly, 50%
identified thawing and re-freezing food as a cause, and 40% reheating
food or under-cooking. However, only 18% recognised keeping food at
room temperature to be a cause of food poisoning and only 29% of the
sample indicated that allowing raw food to contaminate cooked food was a
cause.

The need for good temperature control of cooked foods was not so well
appreciated. Keeping food at room temperature was recognised as a
cause of food poisoning by only 18% of the sample.

Pests have a reputation as "spreaders" of disease and this view was
reflected in the results of the survey. Some 63% thought flies to be a
cause of food poisoning, 34% mice, 32% cockroaches, and 14% other
animals and birds.

Over half, 51%, recognised that keeping food for a long time could cause
food poisoning, but only 43% thought that leaving food uncovered and 37%
that insufficient handwashing could do so.
7.4 CAUSES IN PRACTICE

Usually, several causal factors need to happen sequentially in order for food related illness to result. For example, to cause illness, Staphylococcus aureus must be transferred to cooked foods during handling. Time is then required for the production of enterotoxin. The length of time depends on the temperature and nature of the food. There is, therefore, a given probability that each causal factor will occur. The more causal factors that must occur decreases the likelihood of illness resulting.

To cause infection, the pathogen commonly has to multiply in order for the number of viable cells to be sufficiently high, or to produce adequate toxin to result in symptoms. The person who ingests the food must be susceptible to the level which has been ingested.

With Shigella or the Hepatitis virus there are only two contributing factors. Firstly, contamination from an infected person. Secondly, the pathogen having reached the food, it must then survive until the food is ingested.

Bryan (1988) studied the risks of practices, procedures and processes that lead to outbreaks of foodborne disease in the U.S.A. between 1961 and 1982. The principal factors he found associated with outbreaks from foods prepared in food service establishments were first, improper cooling, second, a lapse of 12 or more hours between preparing and eating, third, colonised persons handling implicated foods, and fourth,
inadequate reheating and improper hot holding. Bryan found that the ranking of all factors changed little over the four periods of review.

Bryan's findings were similar to those identified by Roberts (1982), who studied the factors contributing to outbreaks of food poisoning in England and Wales (Figure 7.2).

Preparation too far in advance and inadequate temperature control were identified as the most important contributory factors for the period reviewed. These were frequently identified in outbreaks of gastroenteritis caused by Staphylococcus, Salmonella, Clostridium perfringens, Vibrio parahaemolyticus, and Bacillus cereus.

Examples of inadequate temperature control included storage at ambient temperature, inadequate cooling, and inadequate reheating. Keeping foods at room or ambient temperature for long durations and sometimes not refrigerating them at all, is an extremely hazardous practice, which presents a high risk of foodborne disease.

The ability to chill and hold foods at a low enough temperature is dependent on the size or quantity of the food and the temperature from which it must be chilled. For this reason, foods that are stored in large or deep containers, where considerable time is required in order to conduct the heat away from the core of the food, have frequently been implicated as the source of foodborne diseases.
Figure 7.2 Factors contributing to 1044 outbreaks of food poisoning in England and Wales 1970-1979

Source: Roberts 1982
The time/temperature combination as a cause of foodborne disease is critical. The correct time and temperature are required in order for spores to germinate into vegetative cells and then for vegetative cells to progress through the lag and logarithmic growth phases and reach sufficient numbers to cause infection. It is also required for toxigenic bacteria such as Bacillus cereus and Staphylococcus aureus to multiply in foods and to produce exotoxins.

Most outbreaks of Staphylococcal food poisoning follow the handling of cooked foods by persons who carry enterotoxigenic Staphylococcal strains on their skins. The risk of food poisoning from contaminated, cooked, moist, protein rich foods are high when they are kept for several hours without refrigeration. Roberts (1987) found that 22.6% of outbreaks of foodborne disease were the result of a colonised person handling the implicated food. The Hepatitis A virus and Norwalk virus are host adapted to humans or primates. Foods are, therefore, contaminated when handled by an infected person who has not washed their hands effectively after defaecation. These diseases and other virus infections are probably more common than the current epidemiological data indicates.

Insufficient cooking can fail to destroy pathogens or reduce their numbers to below the level which causes infection. The situation is similar in the case of insufficient reheating of food, where the risk is even greater, because cooked chilled foods are frequently warmed up rather than thoroughly heated. More micro-organisms are likely to be present as the result of time temperature abuse and would, therefore,
need to be killed during reheating in order to prevent the food becoming a vehicle for infection.

7.5 DISCUSSION

In outbreaks of food related illness, preparation too far in advance, inadequate temperature control and cross-contamination are major contributing factors. It is clear that amongst consumers there is a poor level of awareness of these factors (FDF 1994).

This level of awareness is commonly assumed to be lower than amongst those employed within the food industry. Is this the case? Although a training requirement is to be introduced during 1995 (HMSO 1995), no such requirement has previously existed. As the incidence of food related illness is increasing and similar causative factors continue to occur in outbreaks of food poisoning, there must be doubt as to whether this assumption is correct. Even if correct, then there is a need to consider whether awareness of these factors alone is sufficient.

The effects of training on retailers and caterers perception of the causes of food related illness and on work practices are examined as part of the studies which are detailed in Chapters 9,10,11 and 12.
7.6 REFERENCES


8.1 INTRODUCTION

This chapter reviews the major changes to food safety controls introduced by the Food Safety Act 1990 (HMSO 1990) and food safety regulations made under it. Increasingly, these controls are being influenced not just by UK requirements, but also by EC Directives which are implemented in the UK through the Act. Therefore, the EC approach to the harmonisation of food safety law and the main Directives involved are also reviewed.

8.2 FOOD SAFETY ACT 1990

The Food Safety Act 1990 is the principal statute dealing with food safety in retail and catering establishments in England and Wales. The Act imposes basic food safety requirements, specifies the authorities responsible for the enforcement of these requirements, and sets out a number of enforcement powers to deal with offences under the Act. A legal defence of "due diligence" is provided for these offences.

Within this general framework there are enabling provisions which allow more detailed regulations and codes of practice to be made, in order to deal with specific matters such as hygiene, registration/licensing and training.
8.2.1 Food safety requirements

The main food safety provisions are detailed in Sections 7-14 of the Act. The principal food safety offences are set out in Sections 7, 8 and 14.

Section 7 makes it an offence to render food injurious to health. Injury to health is defined as "any impairment, whether permanent or temporary". In deciding whether food is injurious, regard must be had not only to the probable effect of that food on the health of a person consuming it, but also to the probable cumulative effect of food on their health if they consumed it in ordinary quantities.

A "food safety requirement" is imposed by Section 8 of the Act. This makes it an offence for "any person to sell, offer, expose or advertise for sale, or have in his possession for sale or for preparation for sale for human consumption, or deposit with or consign to another person for sale or preparation for sale for human consumption, food which fails to comply with the food safety requirement". Food fails this safety requirement if (a) it has been rendered injurious to health by various means or operations which are specified in Section 7(i), or (b) it is unfit for human consumption or (c) is so contaminated, that it would not be reasonable to expect it to be used for human consumption in that state.

Although the "Food Safety Requirement" established in Section 8 provides wider criminal liability than existed in previous Food Safety Law, this
liability is not as broad in respect of unsafe food as that which applies to other goods by virtue of Part 2 of the Consumer Protection Act 1987 (HMSO 1987).

The third offence, under Section 14 of the Act which re-enacts Section 2 of the Food Act 1984, makes it an offence for any person to "sell to the purchasers prejudice any food which is not of the nature or substance or quality demanded by them". The three central concepts of nature, substance or quality are used disjunctively and so the prosecuting authority must state which of the three offences the defendant is charged with.

8.2.2 Enforcement Officers

For the purposes of the Act, food authorities in England and Wales are the London Borough Councils, the District Councils and Non-Metropolitan County Councils. The effect is that in Non-Metropolitan areas of England and Wales, which currently have two tier local government, both district and county councils have concurrent responsibility for enforcing the Act. In practice, enforcement duties are divided between Environmental Health Officers, who deal with aspects relating to hygiene and the health of the consumer, and Trading Standards Officers, who deal with more general consumer protection relating to weights and measures.

Enforcement authorities act through their "authorised officers". Prescribed qualifications, required of an authorised officer, are defined in Statutory Code of Practice Number 2 (HMSO 1991\textsuperscript{th}).
8.2.3 Enforcement powers

Improvement Notices (IN)

The Act contains new powers to secure compliance with regulations made under it. Where the proprietor of a food business fails to comply with regulations, then an authorised officer may use an Improvement Notice (IN) to require him to do so. The use of INs is based on a similar enforcement provision in the Health and Safety at Work etc Act 1974 (HMSO 1974). The notice specifies the matters which do not comply with regulations, details the measures which must be taken in order to comply and gives a time period (being not less than 14 days) in which the measures must be completed. This power may be used to secure compliance with any regulations which control the use of any process or treatment in the preparation of food, or the hygiene conditions and practices in commercial food operations. Failure to comply with an IN is an offence in itself, but protection is given to the proprietor through an appeals procedure, which must be initiated within 14 days from the service of the notice. Guidance is given to Authorised Officers on the use of INs in Code of Practice 5 (HMSO 1991).

Emergency Prohibition Notices (EPN)

Section 11 of the Act defines a situation where there is considered to be a health risk condition in a food premises. The health risk
condition exists if any of the following involves risk of injury to health:

(a) the use for the purposes of the business of any process or treatment and/or
(b) the construction of any premises used for the purposes of the business or the use for those purposes of any equipment and/or
(c) the state or condition of any premises or equipment used for the purposes of the business.

Where an authorised officer is satisfied that the health risk condition is fulfilled, he may use an EPN, served on the proprietor of the business, to impose an appropriate prohibition. This power allows a food premises, part of a premises, items of equipment or a process to be prohibited. Although such a notice can have immediate effect the Authorised Officer must make application to the Magistrates Court to have the Notice "confirmed". Guidance on Prohibition Procedures is given in Code of Practice (HMSO 1991f).

Prohibition orders (PO)

If the proprietor of a food business is convicted of an offence under hygiene or food safety regulations and the court before which he is convicted is satisfied that the health risk condition is fulfilled at that business, the court may impose a PO, preventing that person carrying on a food business for whatever time limit the court determines.
8.2.4. Statutory Codes of Practice

The Act empowers the Minister to issue codes of recommended practice regarding the execution and enforcement of the Act and regulations or orders made under it. Food authorities must have regard to the provisions of such codes and comply with any direction given.

8.2.5 Defence of Due Diligence

Section 21 of the Act provides a statutory defence for strict liability offences contained within it. This provision is intended to strike a balance which imposes strict liability, whilst exonerating those who have done all they can to prevent an offence being committed. The defence is available to a defendant who has taken "all reasonable precautions and exercised all due diligence to prevent an offence occurring". This defence and the requirements to meet it have been the focus of much attention in the food industry. The burden of proof rests with the defendant, who has to establish that he/she has fulfilled the requirements on the balance of probability and the evidence must be in a form acceptable to the Court.

The defence requires two key criteria to be met. Firstly, that "all reasonable precautions" must be taken. This demands that a control system must exist, i.e. it is established, documented and appropriate. Secondly, that "all due diligence" is taken. This means that the control system must be effective, i.e. it is implemented, audited, and reviewed.
Several bodies have published guidelines on the defence (FDF 1991) and to this end they recommend the use of HACCP and the Quality Assurance type approaches. Comprehensive written records are considered essential to provide proof of the systems in operation and their effectiveness. Although there is no legal requirement to do so, some businesses developed systems on this basis after the Act was introduced. The extent to which such an approach has been adopted within the retail and catering sectors is examined within chapters 9, 10 and 12.

Given this background and the introduction of a requirement to implement a HACCP approach from 1995 (HMSO 1995), it is significant that the Government advise that written records are not required in all cases.

8.2.6 Registration/ Licensing of Food Premises

Section 19 of the Act enables the Minister to make regulations for the registration and licensing of premises used for a food business. The Food Premises Registration Regulations 1991 (HMSO 1991), made under this section, require proprietors to register if their food business operates for more than five days in any four consecutive weeks. The registration is free and cannot be refused.

Richmond (HMSO 1990) considered that in order to adequately protect public health, there was considerable advantage in prior inspection and approval before a food business was opened or a process started. He believed that a system of formal licensing, involving prior inspection, should be extended to a wide range of food operations, including all
catering establishments and those carrying out butchery and the
processing meat.

The registration requirements (HMSO 1991) fall short of this and despite
concerns about the inadequacy of the current arrangements, there is no
general requirement for retailers or caterers to be licensed. In
formulating policy on this issue, considerable emphasis was placed on
the possible burden of such a system on business. The views of
retailers on this matter have, therefore, been examined and are
discussed in chapter 10.

8.2.7 Training

The Act allows LAs to provide training courses in food hygiene for
persons who are or intend to become involved in food businesses. There
is, however, no requirement for food handlers to be trained. For the
first time training is to be mandatory (HMSO 1995). Food handlers will
need to be trained "commensurate to their work activity".

The level or type of training is not prescribed. This means that the
requirement is open to differing interpretation. Such a situation is
unsatisfactory. It is to be hoped that more detailed guidance will be
given in the Industry Guides to Good Practice.
8.2.8 Food Sampling

One pro-active arm of food safety enforcement is the microbiological examination of food samples. This enables inadequate processing or cross-contamination to be identified and statutory standards to be monitored. Authorised officers are empowered to procure samples of food for analysis in two distinct ways, either by taking or purchasing a sample.

Section 29 of the Act permits an officer to obtain samples of any food or substance by "purchase". He may only "take" a sample of food, or substance capable of being used in the preparation of food, where it appears to him to have been intended for sale or to have been sold for human consumption.

The Act also provides new general sampling powers which extend the situations in which an officer can "take" samples and the range and products that he can "take". The effect is that a sample may be taken from any food source, or any contact material. The obvious advantage of this extension is that it allows sampling and analysis of products at a far earlier stage of the production process. The provision relating to the sampling of contact materials is equally useful, in that it permits the sampling of items such as packaging that will come into physical contact with a food product and could introduce contamination.

Of paramount importance in sampling is the actual procedure by which the product or substance is sampled. This needs to satisfy any statutory
requirements and provide proper evidence in any subsequent proceedings. Although the Act does not provide detailed procedures, the manner in which samples must be taken are prescribed in the Code of Practice on Sampling for Analysis (HMSO 1991). Once a sample is procured, this may be submitted to a public analyst or food examiner for examination and analysis.

8.3 FOOD HYGIENE REQUIREMENTS

8.3.1 Food Hygiene (General) Regulations 1970

Detailed requirements relating to hygiene in retail and catering premises are set out in the Food Hygiene (General) Regulations 1970 (HMSO 1970). For mobile vehicles, similar provisions are set out in the Markets, Stalls and Delivery Vehicles Regulations 1966 (HMSO 1966). These regulations set minimum structural and hygiene requirements for food premises, and make provision for the temperature control of food in catering establishments.

The regulations are fundamentally weak, seeking to prescribe a standard for all food premises from sweet shops to food production factories. They were formulated before many modern food processing systems were in operation and are primarily concerned with structure rather than systems and practices. In addition, the vague and general wording of the regulations make them difficult to enforce.
8.3.2 Temperature controls

Prior to 1 April 1991 the only statutory requirements to keep certain foods at specified temperatures were contained in the Food Hygiene (General) Regulations 1970 (HMSO 1970) and the Food Hygiene (Markets, Stalls and Delivery Vehicles) Regulations 1966 (HMSO 1966). These required certain foods in catering operations be kept at or below 10°C or at or above 63°C.

From 1 April 1991 new regulations were introduced (HMSO 1990). These were implemented in stages. From that date, "relevant" foods listed in the Regulations were required to be kept at or below 8°C or at or above 63°C throughout the food chain. This requirement was subject to a number of time limited exemptions.

From the 5 July 1991, the regulations extended the list of relevant foods and introduced further time limited exemptions.

The final stage of implementation commenced on 1 April 1993 and reduced the chill temperature requirement from 8°C to 5°C for many of the relevant foods. This is the current statutory position in England and Wales.

The extension of temperature controls to the whole of the food chain was a very important step towards improving food safety. Inadequate temperature control, as has previously been identified, is a major factor implicated in outbreaks of food related illness. Unfortunately,
the regulations are complex and perceived as a "temperature jungle". They are difficult to enforce and many businesses find the two tier temperature requirement difficult in practice. As a result, these businesses have had to work to the lower of the temperatures and have had difficulty getting equipment to meet this requirement without incurring considerable costs.

A review of both domestic and EC temperature controls was undertaken in 1994 (HMSO 1994”). Arising from this revised proposals were timetabled to come into force with the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995). The introduction of these new temperature provisions has been delayed pending the agreement of the EC. The main features of these proposals are:

(1) A general requirement to keep foodstuffs likely to support the growth of micro-organisms or the formation of toxins at temperatures which would not result in a risk to health.

(2) A requirement to keep such foods at or below 8°C, with some exemptions.

(3) A facility for upward variation from the maximum chill temperature.

(4) A hot holding requirement of at least 63°C.
(5) Tolerances for limited periods outside chill and hot holding control.

The changes would, therefore, remove the "list of relevant foods" and replace the two tier controls with a single $8^\circ C$ control.

When new temperature controls were introduced in 1991, considerable debate took place over the merit of a single temperature control provision. The Government argued that this would be burdensome on the trade and supported a two tier system. It is interesting, therefore, that in the proposed requirements, a single temperature control is preferred as being deregulatory and reducing the burden on business.

8.4 EUROPEAN LEGISLATION

Food legislation within the community is administered by a number of different Directorates General. Particularly important are those dealing with the internal market and with agriculture. Within the food sector, technical requirements for food products differed markedly between member states and these formed a restriction on trade. A significant increase in the development of appropriate Directives was, therefore, required to improve this situation, in order to move towards an open market. In its White Paper on "Completing the Internal Market" (HMSO 1985) and subsequent communications regarding EC legislation on foodstuffs, the Government set out a "new approach" to the harmonisation of food law.
Previous Directives which had been adopted were analysed. The findings indicated that member states had been more willing to adopt measures of a "horizontal nature" containing general food safety principles. Detailed prescriptive controls, so called "vertical" measures, caused difficulties in reconciling differing opinions between member states. It was, therefore, proposed that a distinction would be made between those matters which, by their nature, needed to continue to be the subject of legislation and those areas whose characteristics were such that they did not need to be regulated. This division has subsequently been defined in the European Court. The so called "Cassis de Dijon" judgement. The Commission indicated that future community legislation should be limited to provisions justified by the need to protect public health, provide consumers with information and protection in matters other than health, ensure fair trading, and provide for the necessary public controls.

This division is the rationale behind highly prescriptive controls in relation to fresh red meat, meat products, fishery products, milk and milk based products and egg products, whilst hygiene controls remain as general principles.

8.7.1 The Official Control of Foodstuffs Directive

The Directive deals with the "control" of foodstuffs in order to protect public health. It requires that products for other member states must be inspected with the same care as those for the home market and that those for export in the community must not be excluded. It also
requires control to be regular and to take place when non-compliance is suspected. Such control must take place at all points in the food chain and hence the Directive requires in-factory enforcement.

Article 5 directs that this "control" should cover inspection, sampling and analysis, inspection of staff hygiene, examination of written and documentary material, examination of any verification systems set up by the undertaking, and examination of the results obtained.

When inspectors discover or suspect any irregularity, they are required to take the "requisite measures". Inspectors must, therefore, be given sufficient powers to undertake the work specified and food businesses be required to undergo inspection and assist inspectors. Article 14 describes the initial arrangements for a programme of inspections and the way in which the commission will respond to the programmes of each member state. The provisions of the Directive are enacted in UK legislation through the Food Safety Act 1990 and regulations made under it.

The UK is required to submit to the Commission annual inspection returns so that the programme may be monitored. To this end, LAs are required to submit quarterly returns on inspection, enforcement, and sampling activity to MAFF who collate this information.
8.7.2 The Food Hygiene Directive/Food Safety (General Food Hygiene) Regulations 1995

This Directive was adopted by the European Community on 14th June 1993. It sets out general hygiene principles and conditions which apply to all food businesses and all types of food. It does not, however, cover primary food production such as harvesting, slaughter or milking or where more product specific controls have been introduced. For example in the manufacture and handling of products of animal origin such as meat, meat products, fish, milk and egg products.

Catering and retail food businesses need to meet the minimum baseline standards set out in the Directive. Detailed prescriptive rules are not stipulated, the standards specified being similar to those in existing UK Hygiene Regulations, which have been in force for the last 30 years.

More significantly, however, the Directive introduces three important new concepts. Firstly, it places a responsibility on the operator of a food business to "identify any step in their activities which is critical to ensuring food safety and to ensure that adequate safety procedures are identified, implemented, maintained and reviewed on the basis of principles used to develop the system of Hazard Analysis Critical Control Points (HACCP)". The second requirement is that food handlers be trained in food hygiene matters to a standard "commensurate with their work activity". This means that where the risk is low then less effort in training is required than where the the risk is high.

Thirdly, the development of industry guides to good hygiene practice. Such guides will not be legally binding but will act as guides to
compliance with Regulations made under the Directive. Where appropriate, these Codes must have regard to the Codex International Code of Practice on General Principles of Food Hygiene (FAO/WHO 1985).

The Directive will be implemented in the UK through the Food Safety (General Food Hygiene) Regulations 1995 which will come into force in September 1995.

8.8 CONSISTENCY OF ENFORCEMENT

The new enforcement powers introduced by the Act were initially used to varying degrees by different LAs (Fletcher-Cooke 1992). Early statistics showed that only 8% of inspections resulted in Improvement Notices being issued. LAs were reminded of the guidance given in Code of Practice 5 (HMSO 1991”), which required that the use of INs "should always be considered as the first option where defects are found on inspection". The result was a general increase in the number of food safety inspections and the use of INs. It is understandable, therefore, that these changes nurtured a perception amongst retailers and caterers that food laws were "tightening". These changes also coincided with a number of new items of legislation and the economic recession. There was, not surprisingly, a resulting backlash against the changes, which was directed at the level of enforcement and enforcement officers (North 1993). Criticisms included the variation in standards, over-emphasis on structure and overzealous behaviour.
Given that the Act was the first major change in Food Safety legislation this century, it is not surprising that there were difficulties during its implementation. Inconsistencies between LAs in the level of inspection and degree of enforcement, which previously remained hidden under the more informal enforcement system, suddenly became far more "visible".

This was compounded by wholly inadequate hygiene regulations, which left enforcement directed largely towards structural matters rather than practices. Whilst Enforcement Officers must in some instances be rightly criticised for concentrating on structure, this was essentially a symptom of the inadequate statutory controls within which such officers had to work.

Although Codes of Practice issued under the Food Safety Act 1990 gave guidance on particular aspects of the Act the Government set up an advisory panel to consider uniformity of enforcement. Subsequently the remit of the Local Authority Co-Ordinating Body on Food and Trading Standards (LACOTS) was expanded. LACOTS is a non-statutory body sponsored by the Association of District Councils, the Association of Metropolitan Authorities, and the Association of County Councils and amongst other functions promotes a uniform interpretation of the Food Safety Act and regulations made under it. It also co-ordinates the practical aspects of enforcement work. Recognition has been given to the work of LACOTS in new and revised Codes of Practice issued by the Department of Health.
Amongst other guides issued by LACOTS one regarding Food Safety Policies recommends that LAs should have a documented policy on food safety enforcement (LACOTS 1994).

In addition, EHOs through their own Institution have regional Food Study Groups and many now undertake auditing of enforcement procedures between LAs in their region and between regions.

8.9 DISCUSSION

Changes introduced by the Act highlighted inadequacies in food safety controls and led to dissatisfaction with the regulatory system. Deregulation to ensure that legislation imposes no unnecessary burdens on business has been central to UK Government policy since the 1985 White Paper "Lifting the Burden" (HMSO 1985"). On 14 September 1993, the Government announced the Food Law Deregulation Plan (HMSO 1993") which set out five principals for deregulation. Two key elements are:

(a) Deregulation last, and

(b) Competition: regulation must not put the UK at a disadvantage with its competitors or trading partners.

Against this background a review of EC Food hygiene Directives was undertaken "to identify areas where it should be possible to ease the burden of food legislation on industry and enforcement authorities, whilst maintaining effective public health safeguards" (HMSO 1994").
Product specific EC Directives commonly involve a high degree of prescription and historically this has been seen in many quarters as the correct approach. The current ethos, however, is away from prescription and towards the application of standards and controls proportionate to the hazards associated with a food business based on risk assessment.

The UK Government played a major role in the drafting of The Hygiene of Foodstuffs Directive (EEC 43/93) which is seen as an example of a more flexible risk based system of control. This Directive reflects the current ethos within the UK of "minimal prescription". It is interesting that despite criticism of existing UK food hygiene regulations, the new draft regulations to implement the Directive remain very similar and continue to focus on structure and equipment. The major changes, as have been highlighted, relate to the requirement for food handler training and for a HACCP approach to be adopted. It remains to be seen whether these welcome requirements are more effective in addressing the causes of food related illness than previous legislation. These aspects are the subject of study and discussion in Chapters 9,10,11 and 12.

8.10 REFERENCES


CHAPTER 9  A STUDY OF THE EFFECTS OF THE FOOD SAFETY ACT 1990 ON FOOD
RETAILERS AND CATERERS - METHODOLOGY

9.1 INTRODUCTION

In April 1990, prior to the implementation of the Food Safety Act 1990, a survey of 5250 food premises in England and Wales (Audit Commission 1990) indicated that 19% of take aways, 17% of restaurants, cafes and canteens, 13% of hotels and guest houses and 11% of pubs, clubs and bars presented a significant health risk.

The factors most commonly assessed as high health risks were ineffective monitoring of temperatures, poor awareness of hygiene amongst staff and management, inadequate hand washing facilities and poor practices leading to cross-contamination.

The findings indicated that commonly acknowledged causes of outbreaks of food poisoning (Roberts 1982) (Bryan 1988) were still a matter for concern in a large number of food premises. Existing legislation under the Food Act 1984 (HMSO 1984) and subsidiary regulations were concerned primarily with structural matters and there was little formal control regulating practices. Temperature controls only applied in catering establishments and the mandatory 10°C maxima for refrigerated foods was inappropriate for pathogens such as Listeria and Aeromonas.

In Chapters 7 and 8, the increasing incidence and causes of food poisoning have been described. Catering premises have been implicated
as major sources of outbreaks of food poisoning. It is easier to identify a source establishment and/or food in outbreaks where a large number of people have been affected. It is likely, however, that sporadic cases which cannot be traced to a particular source may also be associated with catering establishments, or foods purchased from retail outlets, in which inappropriate food handling practices have been followed.

There remains, therefore, a large number of food related illnesses where the source is unknown, or where there is only anecdotal evidence as to its identity. There is, however, general agreement with regard to the risks and practices associated with food related illness.

Richmond (1990) (1991) identified refrigeration and temperature control, operational practices, training, staff awareness, and a HACCP type approach as being important steps to improving food safety in retail and catering establishments. Through the Act and subsidiary legislation the Government has sought to address these issues.

How effective the action taken will be in preventing food related illness will depend on how adequate the provisions are, whether the changes introduced are accepted and implemented by the food trade, and whether the enforcement powers are adequate to ensure compliance. Clearly, however good legislative controls are, they can only be effective if they are acted upon by the food trade.
The purpose of this study is to:-

a) Identify the extent to which caterers and retailers operate systems to control key factors that lead to food related illness. For example, temperature control, cross-contamination, pest infestation and cleaning.

b) Identify caterers and retailers perception of the causes of food related illness and to compare these to the actual causes.

c) Assess caterers and retailers perception of the effect of the Food Safety Act 1990 on their business.

d) Assess whether there has been a change in caterers and retailers operations as a result of the Act.

e) Consider whether these will be effective in addressing the causes of food related illness previously identified.

f) Identify the importance of HACCP and hygiene training to caterers and retailers and whether the application of HACCP is practical in their operation.

e) Indicate what further changes are required to address these problems.
9.2 SELECTION OF THE SECTORS FOR STUDY

Although the changes introduced by the Food Safety Act 1990 apply to all food businesses within the UK, the provisions of the Act have greater implications for some sectors of the industry. The manufacturing sector have, in general, adopted control measures in order to ensure product consistency. Some apply a full QA system (BS 5750) whilst others use a full or partial HACCP system. For companies using such systems, the due diligence defence within the Act has become an important consideration in system design. In retail and catering establishments, this type of approach is far less common, and is considered a "new" concept.

The retail and catering sectors, which have been briefly reviewed in Chapter 2, have undergone large changes in the last twenty years. Although the number of outbreaks of food related illness attributed to retail outlets is small, the failure of the food safety chain in these premises has the potential to affect a large number of people. Illness associated with retailing failure are hard to confirm because cases may be widely dispersed and are likely to be under reported. It is possible that many sporadic cases of illness, assumed to originate in the home, may be the direct or indirect result of poor practices in retail establishments, which compromise the microbiological safety of foodstuffs.

There is a wide variation in the type and size of retail outlets within the UK, ranging from small one person retail grocery shops to large national and multinational supermarket food retailers. One recent
trend, identified earlier in this report, is the increase in the retail sale of pre-cooked meals and ready-to-eat foods. Initially marketed in large retail outlets these are now commonly found on sale in even the smallest outlets. In the prevailing financial climate, and in order to compete with large supermarkets, there is also a general trend to sell a wide range of foods and it is common to see "high risk" microbiologically susceptible products retailed together in the same outlet as raw "contaminated" foods. Many of these outlets have limited resources. The effectiveness of the Act in controlling potential risks from these practices is, therefore, important.

The catering sector of the food industry, because of the multi-variant nature of the products which are produced, has not adopted the QA/HACCP approach as widely as has been the case in the manufacturing sector. Of reported outbreaks of food poisoning within the UK, most result from catering operations. The effectiveness of the Food Safety Act in controlling the risks associated with these businesses is, therefore, critical if the incidence of food related illness is to be reduced.

In both these sectors selected for study, the variation in the size and financial resources of different businesses mean that there is great disparity in the ability of the businesses involved to respond to and comply with the provisions of the Act.

For these reasons, the retail and catering sectors were selected for examination and study.
9.3 QUESTIONNAIRE DESIGN

The design of any questionnaire is fundamental if a good response rate is to be achieved and if relevant and valid data is to be obtained. The general principles of questionnaire design and their application in this study are as follows.

General considerations

It was recognised that the establishments to be surveyed within the study would vary considerably in size and type. Questions, therefore, needed to relate to subject areas relevant to all and to be written in a fashion that made them understandable and pertinent.

The need to distinguish between different sizes and types of retailer and caterer was also recognised. General questions to identify the size of the establishment, the number of employees and the types of food sold were devised. These were also important in assessing the potential risk from the premises. The types of food being sold were relevant, because these had a direct bearing on the relevance of questions later in the questionnaire.

A specific area for study was the effect of the Act in addressing the causes of food poisoning. Most importantly inadequate temperature control, cross-contamination, and the level of training. Also, whether the concepts of HACCP, QA and due diligence were understood and whether such approaches had been adopted. More specifically, it was considered
important to establish which activities the proprietor perceived as being either a "risk" or important in preventing food poisoning and how these perceptions corresponded to the actual causes. Further, whether any positive steps had been taken to address these risks. It is not uncommon as an EHO to come across proprietors who, for example, know the importance of temperature control, but fail to take any steps to provide a work system which is designed to ensure that temperature control receives high priority and is strictly maintained.

To facilitate the collation of returned information, the answer matrices were computer coded in the right hand margin of the questionnaire. This draft was given to four EHO colleagues who were asked to comment on the format and clarity of the questionnaire and whether the answers available were adequate.

Subsequently, minor amendments were made to the wording of some questions in order to remove any ambiguities.

A frontispiece detailing the purpose of the questionnaire and requesting the recipient to complete and return it within 14 days was added. A comments sheet was also attached, to enable the respondent to comment on the clarity of the questionnaire.

The same procedure was then undertaken for the design of the catering questionnaire. Comments were also sought from three colleagues teaching in catering colleges.
Both questionnaires were examined by and discussed with EHOs from the DOH and amendments incorporated to respond to some of their comments.

Selection of subject areas for study

One of the primary purposes of the Act was to prevent food related illness. In Chapter 7 inadequate temperature control and cross-contamination were identified as two major factors implicated in outbreaks of food poisoning (Roberts 1982) (Bryan 1988).

A study in England and Wales, undertaken by the Audit Commission in 1990 (Audit Commission 1990), indicated that in 16% of all food premises studied, temperature monitoring was a high risk factor. In those premises which were assessed as being a high risk to health, 60% lacked effective temperature monitoring.

In the same study, cross-contamination resulting from poor work practices was found to be a high risk factor in 12% of all food premises and from equipment in 56% of premises that were assessed as being a high risk to health.

The findings showed a marked difference in the extent of staff training at different types of premises and indicated a link between good training and lower health risk from a premises. For example, training was assessed as poor in only 8% of hospitals, but in 69% of takeaway establishments.
In 13% of all food premises the level of staff "hygiene awareness" was a high risk factor. The level of awareness was not significantly better amongst management, where it was a high risk factor in 11% of premises. In those premises assessed as being a high risk to health, staff hygiene awareness was considered to be a high risk factor in 67% and management hygiene awareness in 64%.

The temperature of microbiologically susceptible foods has been the subject of control by regulations made under the Act (HMSO 1990) (HMSO 1991). It is significant that the retail sale of chilled and frozen foods has become an important part of this sector, which devotes 60% of supermarket shelf space to the sale of such products. Clearly, if these foods are handled incorrectly then there is a potential for microbiological hazards to occur.

Temperature control, cross-contamination, and the extent and level of hygiene training were, therefore, considered to be important subject areas for study.

The application of a HACCP type approach in catering and retailing has been widely advocated and Richmond (Richmond 1990) endorsed this approach concluding that "HACCP is a sensible approach to good manufacturing practice if properly carried out". Subsequently a requirement for HACCP type approach in all food premises was incorporated in European legislation (EEC 43/93) and in England and Wales is included in the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995). This approach has been supported by the Government
through the Assured Safe Catering System (HMSO 1993\textsuperscript{*}). The degree to which a HACCP type approach had been adopted by businesses was considered to be an important area for investigation.

Secondary issues relating to the Act which have been the subject of criticism by the trade include its enforcement, practical implications, the cost of implementation and its financial and operational effect on food businesses. The perceived benefit and practical effect of the Act were also included as areas for study.

There has been considerable discussion on the benefit of the Act and its effect on various sectors of the industry. It was considered important for this study to review the actual effects on retailers and caterers.

Relevance

When designing questionnaires it is essential to ensure that the questions are relevant, both to the hypothesis under investigation and to the respondent, in order that the respondent is able to provide relevant information (Moser and Kalton 1981).

In achieving the objectives of the study, which were described in Section 9.1, it was considered that a separate questionnaire should be used for retailers and caterers. This would help to make the questionnaire relevant to the business to which it was sent and, therefore, help to achieve a better return. It would also be beneficial, in that if a joint questionnaire was used, some questions
for caterers would appear irrelevant to the retailer and this could have reduced the level of their return. The converse is equally true. Whilst identical core questions were included in both questionnaires separate questionnaires were, therefore, devised for retailers and caterers.

In designing questions, account had to be taken of the diversity of the sectors under study. Establishment size, the level of proprietor knowledge, and the nature of the operation were considered important factors. Questions were, therefore, kept as relevant as possible to work in a practical situation and to activities common within the wide variety of operations.

Sources of erroneous information

There are various reasons for a respondent either failing to answer questions, or providing false information. The following were considered to be relevant to this study:

a. The respondent may feel that the information given could be used against him.

This is not an uncommon phenomenon and given that the questionnaire was being sent by an EHO, the respondent could be reluctant to complete it. He may also give the answer he perceived was expected, rather than what he genuinely felt or was actually true for his establishment. It was acknowledged that the use of an area code on the rear of the
questionnaire could enhance the respondents fear that the information he gave could be related back to him. However, it was considered that the risk of non-return for this reason was acceptable, given the importance of information on regional levels of return and differences in response. Evidence from the returned questionnaires indicated that a small proportion of the respondents were clearly unhappy about returning the questionnaire for this reason and either obliterated or removed the number. In most cases it was possible to read the code even after it had been obliterated, but this was not possible where the number had been cut away. To try and prevent removal of the number, all subsequent questionnaires were numbered next to the staple, in order to make it difficult for the number to be cut away. This helped to reduce the incidence of this occurring and is discussed further in Chapter 10.

b. The respondent may answer in the way he feels he should.

This was considered to be likely, given the use of an area identity number as described above. For this reason, questions were designed to cross-reference and allow the response to be cross-checked for consistency. For example, where a caterer responded to question 7 of the catering questionnaire by indicating that he operated a HACCP system. Fundamental to a HACCP system in a catering establishment would be a temperature control and monitoring system. This answer is, therefore, cross-referenced with question 8 which asks what type of thermometer the establishment has for monitoring food temperature. If the respondent claimed to have a written HACCP system it would clearly be inconsistent if he later indicated that he had no thermometers with
which to monitor food temperatures. Further cross-checks to verify whether HACCP is really being applied can be made through questions 9, 10, 11, 14, 15, 16, 17, 18, and 21.

c. The respondent has not got the time.

Personal experience in food establishments suggested that this could be a particularly important factor and that it would be essential to construct questions that could be completed with a minimum of effort. Further, that the length was kept to a minimum so that it was more likely to be completed. For this reason, questions were written so that they could be quickly read and could be answered by ticking a box, rather than the respondent having to write an answer. All but one of the questions were constructed in this way. The exception required a number to be written against a list of answers, in order to rank the importance of causes of food poisoning.

The length of the questionnaire was kept to a maximum of seven sides in order to ensure that it did not appear to onerous, detailed or lengthy to complete. Whilst it would have been possible to construct a more complex and detailed questionnaire which would have provided a greater range of data, it was considered essential to achieve a good level of return. The questions were, therefore, kept as simple as possible in order to adduce adequate information whilst at the same time encouraging a good level of return.
A prepaid pre-addressed envelope was provided for the easy return of the questionnaire and so that the cost of returning the questionnaire was not a deterrent to its completion and return.

d. The respondent may feel that the questions are irrelevant, vague or not applicable.

Questions were phrased so as to be as clear as possible and to relate to the type of food business to which they were to be sent. A separate questionnaire was designed for both retailers and caterers in order to make it more relevant to each respective sector and, therefore, encourage its return. It was also considered important to incorporate some questions where the respondent would feel that he could express his opinion and "have a say", but which could still be completed by ticking the relevant answer. For example, questions 4, 5, 6, 13, 15, 16, and 20 of the catering questionnaire all provide relevant information, but the questions are worded so that the respondents feel that they are able to express their opinion. The pilot study, described in section 9.4, helped to identify vague questions. Respondents were asked for comments on the questions, in order to identify any aspects they considered to be irrelevant or inapplicable.

e. The respondent may fear looking foolish.

It was considered that respondents could feel that their answers would be inadequate if they were required to write their own answer, rather than select an answer from those given. This fear could also be
increased if the respondent felt that the answers he gave could be traced back to him and could also be a reason for giving erroneous information or answering in the way he felt he should, as previously discussed.

As well as being difficult to record and analyse, this type of question could also have acted as a disincentive to returning the questionnaire. For this reason and those detailed previously, a simple tick answer format was adopted.

Wording of the questions

The wording and importance of the questions has to be carefully considered as this may affect the nature of the reply given (Moser and Kalton 1981). The importance of asking specific questions to obtain specific answers was considered essential and general questions, for example questions 1, 2, and 3 of the catering questionnaire, were used as a screening process for subsequent specific questions, in order to allow cross-tabulation of answers to be undertaken.

The questions were designed so that the respondent did not have to write a freehand answer and were kept specific to the subject areas of the study. In order to identify any ambiguities in the wording of the questions 3 EHO colleagues, 3 lecturing colleagues teaching in catering colleges, 3 caterers, and EHOs at the DOH were consulted as previously described. As a result of their comments, some questions were refined and reworded in order to ensure that the ambiguities were removed. A
pilot study was then undertaken in order to identify any further ambiguities which needed to be rectified prior to the study being undertaken.

**Ambiguous questions**

Ambiguity can lead different individuals to understand the same question differently, therefore, in effect answering different questions. Every care was taken to avoid this problem and the consultation and pilot study acted as a screening process to identify ambiguous questions.

Question 13 of both questionnaires is an example of a question which was altered to remove some ambiguity. This question was intended to force respondents to rank in priority order the major causes of food related illness. In the pilot questionnaire, the question asked respondents to "Please rank from 1 to 6 which of the following you think causes the greatest number of cases of food poisoning in the UK. (1 indicates the highest number of cases caused and 6 the least)". Examination of the answers given indicated that 5 (12.5%) of respondents were assigning the same ranking to a number of causes. In order to clarify that the causes must be ranked in priority, the question was amended to read "Please rank in order of priority from 1 to 6 which of the following you think causes the greatest number of cases of food poisoning in the UK. (1 indicates the highest number of cases caused and 6 the least)". This minor modification to the questionnaire reduced the level of misinterpretation and only 18 respondents (1.7%) failed to answer the question the way it was intended.
Double barrelled questions

It is important that two questions are not included in one. This can lead to frustration on the part of the respondent and may lead to problems of interpretation when the information provided is analysed. Considerable care was taken to construct individual questions to avoid this problem.

Vague words

The use of words such as "generally", "often" or "many" which can encourage vague replies was avoided. It is possible that some respondents may not have known the meaning of some specific terms. For example, terms such as HACCP, QA, and due diligence may be new to some respondents. It was considered that this may cause them to answer in the way they felt would be expected, without actually knowing what the terms meant. It was, nevertheless, considered impractical to make the questions clear and concise without using these terms.

Leading questions

The structure of a question can lead to a respondent being directed in a certain way. For example, the use of the format "You don't think... do you?" is likely to lead to a negative response. This can lead to a questionnaire bias. Questions were accordingly developed to be as neutral as possible.
Presumptive questions

Questions should not presume anything about the respondent. The use of technical terms such as HACCP, QA, and due diligence assumes a knowledge of these subjects. It was, however, considered impractical to construct questions without using these terms and with the safeguard of cross-question checking was considered acceptable.

Level of wording

When choosing language for a questionnaire, the population under investigation should be kept in mind. The aim of the questionnaire is to communicate effectively with the respondent and the language of the questionnaire should be adapted appropriately.

Categories of response

Two categories of response are identified in terms of question structure:-

(a) Open ended questions do not specify any response category into which the respondent must fit his reply. They allow the respondent to expand his response to a question and allow for the clarification of detail. Such questions frequently lead, however, to the recording of irrelevant data, and can lead to difficulties in analysis, particularly in quantitative studies.
(b) Closed ended questions restrict the respondent in categories of response. Whilst making the quantitative analysis of data easier, they often lead to incomplete answers, with the respondent becoming frustrated at not being able to express his opinions. Most questionnaires contain a mixture of open and closed ended questions, depending on the nature of the individual questions and the information required. The questionnaire developed was composed, for the most part, of closed ended questions with fixed categories of response.

Question order

The combination and order in which questions are presented in a questionnaire depend upon the nature of the investigation. The questions were arranged in a semi random fashion, so that the sequence of questions did not imply to the respondent that a particular answer was more appropriate and, therefore, encourage the respondent to give erroneous information in the belief that this was more appropriate. For example, question 5 of the catering questionnaire asks for information on the importance of a variety of activities in the safe operation of the food business. Much later in the questionnaire, question 14 asks what activities are recorded in writing. If question 14 had immediately followed question 5 then the respondent may have unconsciously inferred that the two were linked and that an implied answer was required.
Questions need to be clear and concise so that the person completing them is able to do so easily. If this is not the case, then the response to the questionnaire can be seriously affected. The design, therefore, needs to strike a balance between providing the right level of technical information, tempered by having to secure the co-operation of the person to complete the questionnaire. This will hinge largely on the difficulty and clarity of the questions contained in it.

In this way, a basic set of questions were constructed, and these were then collated into a draft questionnaire. It was considered that the questionnaire should be of a size and layout such that it appeared easy to complete. At the same time it needed to be of sufficient length to provide an adequate amount of data. The catering questionnaire contained 22 questions whilst the retail questionnaire contained 20 questions.

9.4 PILOT STUDY

In order to obtain a representative sample return, from which meaningful conclusions could be made, a target sample return of a thousand questionnaires from each sector was set. In order to test the methodology, to evaluate the questions in the draft questionnaires and to determine what level of distribution would be required in order achieve a return of this size, a pilot study was undertaken within the area of Guildford Borough Council during October 1992. Draft
questionnaires, together with prepaid return envelopes, were distributed
to forty randomly selected retail outlets and to forty randomly selected
catering outlets within the borough. A thirty-eight per cent return was
achieved with the retail questionnaires and a thirty-three per cent
return with the catering questionnaires.

In order to ascertain the reasons for non-return and to identify any
problem that could be rectified prior to the study taking place, 10 non-
returning caterers and retailers were visited. Most said they had not
completed the questionnaire because of time constraints, but no other
specific reasons were identified. Three of the retailers and two
caterers claimed not to have received the questionnaire.

The data from returned questionnaires was entered onto a spreadsheet,
using "Unistat" statistical software, in order to test the entry,
storage and examination of the data. Whilst the examination was
satisfactory, problems with the entry of the data were identified. It
became clear that it was very easy and common to make an error during
data entry, which was not evident at the time. The entry of a large
return could also be extremely time consuming because of the need to
enter an area code for each questionnaire. For these reasons, further
statistical software packages were tested. These were "Supercalc 5",
"Lotus 123", and "Epi info 5". The software "Epi info 5" was selected
as being the most suitable for the study and the final questionnaire
format was set up on the database for use with the study.
Although the level of return in the pilot study was acceptable, it was considered that further improvements should be made in order to try and enhance this, since outside of the borough the level of return could reduce in areas where there was a poor relationship between the LA and the proprietors of food businesses. In order to achieve a better return, the following action was taken:

(a) The DOH and the IEHO were contacted and their support sought. In particular, authority to use their logo on the questionnaire was requested. It was considered that this would enhance the perception of the study by the recipient and could help to achieve a better level of return. Unfortunately, neither organisation were able to offer support in this respect and, therefore, the logos of Guildford Borough and Surrey University were used in the study.

(b) Several changes were made to the wording, design and format of the questionnaire in order to make it more "marketable" in appearance and to ensure that any ambiguities identified in the pilot study were removed in order to ensure that the questions were clear.

Using the level of return in the pilot study as a basis, it was considered necessary to distribute approximately 3500 questionnaires to retail outlets and a further 3500 questionnaires to catering outlets in order to achieve the desired level of return.
9.5 DISTRIBUTION AND RESPONSE

To distribute the questionnaire to 3500 caterers and 3500 retailers in England and Wales it was necessary to obtain a list of names and addresses from which businesses could be selected. Options included:

(a) Writing to trade organisations asking for members details.

(b) Identifying businesses from the yellow pages telephone directory.

(c) Purchasing data from a datahouse.

(d) Obtaining the data from Local Authority Environmental Health Departments.

Many retailers and caterers are not members of trade organisations and option (a) was not considered to provide a representative cross-section of establishments. Trade organisations may also have been reluctant to release details of their members.

Whilst the yellow pages telephone directory provides a useful source of business addresses, the different categories of retail and catering establishments are spread between a number of headings within the directory. England and Wales is covered by a number of directories and it was considered that selection of premises in this fashion would be extremely burdensome.
The purchase of data from a database was considered to be a costly but viable option. However, since LAs must keep a register of food premises publicly available, and since the research was relevant to the work of LAs it was considered that option (d) should be the first choice, with supplementary data being obtained using options (c) and (b) if necessary.

A letter (Appendix E) was, therefore, distributed to each of the 403 Environmental Health Authorities in England and Wales, requesting that they supply a list of names and addresses for both caterers and retailers within their areas.

In order to help maximise the level of return from LAs, the IEHO was again approached for their support in obtaining addresses from LAs. Unfortunately they were not able to give any support to this request. Within Surrey, I contacted each LA directly and obtained address labels for the study.

A total of 102 LAs responded by sending either lists or address labels for caterers and retailers within their area (Table 9.1). Unfortunately the information supplied was in many instances of limited value. Some 30 LAs sent only a small number of premises from their list. One LA sent only 10 caterers and 10 retailers details and only 4 caterers and 2 retailers from this list could be used as the others on the list were part of a national chain.
<table>
<thead>
<tr>
<th>Authority Type</th>
<th>No of Authorities</th>
<th>No Returning addresses</th>
<th>Per Centage Returning Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>296</td>
<td>76</td>
<td>25.7</td>
</tr>
<tr>
<td>London Borough</td>
<td>32</td>
<td>9</td>
<td>28.1</td>
</tr>
<tr>
<td>Metropolitan</td>
<td>36</td>
<td>5</td>
<td>13.9</td>
</tr>
<tr>
<td>Welsh</td>
<td>37</td>
<td>7</td>
<td>18.9</td>
</tr>
<tr>
<td>Total</td>
<td>401</td>
<td>102</td>
<td>25.4</td>
</tr>
</tbody>
</table>
Only 37 LAs were able to send address labels. This meant that many envelopes had to be addressed by hand or by cutting and sticking the addresses to envelopes. The information sent by a further 19 LAs was unusable because the type of premises was not indicated.

In total, therefore, some 78 LAs supplied names and addresses in a usable format. These were considered to be adequate to form the basis for distribution of the questionnaires.

It was not considered appropriate to distribute questionnaires to outlets belonging to a national chain of the same company. These, in theory, should all be operating to their own company standard. Examples of these included large retail supermarkets such as Tesco, Sainsburys, Safeway, Kwik Save, Co-op, John Lewis, Waitrose and Marks and Spencer and large catering chains such as McDonalds, Burger King, Pizza Hut, and Trust House Forte hotels and restaurants. In the case of these establishments a single questionnaire was sent to the headquarters of the company for completion and return.

Although LAs were given guidance on the types of premises to include amongst caterers and retailers, it was assumed that some would supply names which did not fall into these categories. Since the potential risk associated with premises such as village halls and sweet shops is extremely low and a return would not be representative of the respective food sector, these establishments were excluded from the study when they could be identified. On this basis, premises were selected randomly from the list of each LA in order to make up a representative target.

195
sample of approximately 3500 premises. It was not possible to identify the size or nature of many premises from the lists and, therefore, it was anticipated that this could be reflected in the returned data and would need to be considered in later analysis.

A questionnaire, covering frontispiece and a prepaid return envelope were distributed to each premises. In order to provide a more manageable flow of returned information, batches of approximately 500 questionnaires were distributed each week over a seven week period between January 1993 and March 1993. The back of each questionnaire was annotated with a numerical code which indicated the name and type of LA. This code system was used in order to permit comparison of results between regions and Authorities.

A total of 3181 catering and 3427 retail questionnaires were distributed in this way and Table 9.2 illustrates the total distribution by LA type in England and Wales. A map illustrating the geographical distribution of LA areas from which questionnaires were returned is shown in Figure 9.1.

9.6 COLLATION OF THE DATA

As questionnaires were returned, the data was entered onto the database created on Epi info 5 software (Dean 1990). Within the software system it is possible to define valid field entries for each question and this function was used in order to help assure the accuracy of data entry. This was found to be very effective in preventing incorrect data
Figure 9.1 Geographical distribution of Local Authorities from which questionnaires returned
Table 9.2  Distribution and return of retail and catering questionnaire by Local Authority type, in England and Wales.

<table>
<thead>
<tr>
<th>Local Authority Type</th>
<th>DISTRIBUTION AND RETURN</th>
<th>CATERING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RETAIL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of Questionnaires</td>
<td>Number of Questionnaires</td>
</tr>
<tr>
<td>DISTRICT</td>
<td>2,458</td>
<td>764</td>
</tr>
<tr>
<td>METROPOLITAN</td>
<td>216</td>
<td>59</td>
</tr>
<tr>
<td>LONDON BOROUGH</td>
<td>457</td>
<td>73</td>
</tr>
<tr>
<td>WELSH</td>
<td>296</td>
<td>92</td>
</tr>
<tr>
<td>NOT GIVEN</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,427</td>
<td>1,040</td>
</tr>
</tbody>
</table>

|                      | CATERING |
|                      | Number of Questionnaires | Number of Questionnaires | % Return |
| DISTRICT             | 2,538 | 629 | 24.8 |
| METROPOLITAN         | 248   | 50  | 20.2 |
| LONDON BOROUGH       | 239   | 73  | 30.5 |
| WELSH                | 136   | 42  | 30.9 |
| NOT GIVEN            | -     | 29  | -    |
| TOTAL                | 3,181 | 828 | 26   |
entries, something which had proved a significant problem in the pilot study. The statistics facility within the Analysis module of the package was then used to analyse the data obtained. The results of the study are detailed and discussed in Chapter 10.

9.7 REFERENCES


CHAPTER 10 A STUDY OF THE EFFECTS OF THE FOOD SAFETY ACT 1990 ON FOOD RETAILERS AND CATERERS - RESULTS AND DISCUSSION

10.1 GENERAL CONSIDERATIONS

The catering and retail sectors, which have been the subject of examination within this study, each contain a broad spectrum of establishments. These differ in their size, the foods they prepare or sell and the methods they use to prepare food. Catering premises, for example, may be as diverse as a large hospital kitchen operating a cook-chill system, and a small single person sandwich maker. Retail businesses can range from small owner-operated establishments selling pre-packed food, to large national chain outlets with a delicatessen, butchery and bakery selling high risk open food products.

This diversity gives rise to differences in the requirement for training, the level to which awareness of food safety issues and technical expertise is needed and the financial resources which are available.

Many "national" organisations such as McDonalds, Kentucky Fried Chicken (PepsiCo), Pizza (PepsiCo), Burger King (Grand Met), Trust House Forte, Tesco and Sainsbury operate national company standards and on the assumption that these are applied in practice it was considered inappropriate to send a questionnaire to individual outlets. For this reason, only the head office of each company was sent a questionnaire. Although, therefore, the number of returned questionnaires from such
companies comprised a relatively small sample size, this did allow comparison with other types of outlet.

It was considered unwise to assume that because a company may have food safety procedures, that these were necessarily being followed in each outlet. This was subsequently confirmed by the findings of the case studies which are detailed in Chapter 12.

The areas considered within this study could be influenced by a variety of factors. These include the position of the respondent within the business, the type and/or size of the business, the types of food sold or prepared, and the level of training amongst staff. Returned data was, therefore, examined for differences arising as a result of these factors.

Statistical differences were established using Z-values to compare differences in proportions. Where significant differences are reported all are quoted at the 5% level (p=0.05). Therefore, where "no significance" is stated, findings were below this level.

10.2 QUESTIONNAIRE DESIGN

The diversity of food businesses imposed some limitation on the depth of information that could be obtained within the study. For example, the questionnaire could have been designed specifically for limited distribution to establishments which were part of large national chains. In such establishments a greater level of technical expertise and
financial resource would be available within the companies. More specialised questions on specific aspects of the operation could, therefore, have been incorporated within a questionnaire. However, whilst this would have provided more detailed information, it would not have provided a representative picture of the whole of the sector concerned. A very detailed questionnaire may also have discouraged smaller organisations from responding, since the questions may not have appeared relevant to them.

Although the greatest volume of food is retailed from national supermarkets, small outlets are used by a high proportion of the population and they supply a considerable quantity of "high risk" food. It was considered that these were less likely to have the resources that are available to larger companies and, therefore, that the potential for food related illness to occur may be greater.

The final design of the questionnaire reflected a deliberate balance between the desirable and practical and was intended to ensure that adequate information was collected from a sufficiently broad base of establishments.

It is acknowledged that returned questionnaires were more likely to come from "responsible" organisations and, therefore, the results may imply a rather more reassuring picture than that which actually exists. The extent to which this is true is impossible to assess within the study.
Consultation with various individuals prior to the pilot questionnaire being distributed was extremely helpful. Although few major changes were necessary, it was clear from the comments obtained that some of the questions could be interpreted in different ways by different people. Consultation helped to identify questions within which the wording needed to be amended in order to remove or reduce any ambiguity. For example, in order to allow direct comparison between sectors, the size of retail and catering businesses was initially identified using a common question based on the number of employees. It soon became clear from the comments obtained that, whilst this would provide an easy basis for comparison, it was more appropriate within the catering industry to measure the size of the business by the number of covers per day or the number of meals per day. Although altering the question prevented a direct comparison between retailers and caterers it was considered that doing so would be beneficial, since it would help the credibility of the questionnaire and, therefore, improve the level of return.

During discussions with EHOs from the DOH, it was suggested that although the catering questionnaire contained questions on HACCP, further questions would help to identify the extent to which companies had adopted this type of approach. This was considered important given the background of proposed EC legislation requiring a HACCP approach in food establishments (EEC 43/93) and the development of an "Assured Safe Catering" (HMSO 1993") guide by the DOH. Further questions were, therefore, incorporated in order to explore this area further.
Whilst a local pilot study provided useful information on the likely level of return, it would have been advantageous to have piloted the questionnaire over a wider geographical area to obtain a more representative picture of the likely overall return. It would also have been beneficial to have piloted the questionnaire to a larger number of premises, since the results from the relatively small sample size (50) showed greater significant differences than were obtained in the actual study.

10.3 QUESTIONNAIRE DISTRIBUTION

The distribution of the questionnaire to representatives from each sector was very dependent upon the support from colleagues in other LAs.

Details of LAs providing information are detailed in Table 9.1. The level of return, 25.4%, was lower than expected given the importance of the subject to the work of Environmental Health Departments. It was comparable to the level of questionnaire return from caterers (25.9%) but lower than that from retailers (30.3%). The response could have been influenced by the following factors:--

(a) The workload of the authority. Under the prevailing financial and manpower constraints it may have been necessary for LAs to direct resources to statutory duties and tasks.

(b) The authority may for "political" reasons not have wished to divulge this type of information.
(c) A number of requests for similar information could have been received, thus affecting the workload.

(d) The lack of visible DOH or CIEH support may have influenced the authority not to respond.

(e) The authority may have been concerned that the results from the study could cast their inspection activity in a bad light.

(f) The authority may not have had the ability to produce such a list.

Despite the need to keep a register of food premises by virtue of the Food Premises (Registration) Regulations 1991 (HMSO 1991) and the need to pass on food hazard warnings to the trade under Statutory Code of Practice No:16 (HMSO 1993), it was clear that some authorities did not have this facility. Of the 102 LAs sending information, only 37 sent address labels and 3 of these were hand written labels. This is extraordinary, given the importance of this area of work to LAs, and highlights a serious shortcoming which may be symptomatic of the approach to food safety by many LAs.

Some 78 LAs sent usable information and it was considered that sufficient premises addresses for distribution of the questionnaires had been obtained. Figure 9.1 illustrates the geographical distribution of LA areas in which questionnaires were sent to food businesses. This distribution was considered to provide a representative sample across England and Wales.
Dispatching questionnaires in batches of 500 per week over a seven week period reduced the work involved in distribution, and also helped to smooth the entry of the returned data onto the database spreadsheet.

10.4 QUESTIONNAIRE RETURN

Some 1040 (30.3%) retail questionnaires and 828 (26.0%) catering questionnaires were returned (Table 9.2). These levels, as expected, were lower than that achieved in the pilot study but were considered to be acceptable, given the economic recession and general business climate. The returns were higher than that normally achieved by postal questionnaires of this type. The geographical distribution of returned questionnaires was considered to be representative of England and Wales (Figure 9.1) and the number of questionnaires returned provided a sample size from which soundly based statistical conclusions could be drawn.

Of the returned retail questionnaires, 665 (64%) were returned by "small" or "very small" establishments where the number of employees was less than 5 (Figure 10.1).

It is not surprising, therefore, that 759 (73%) of all retail establishments were single retail outlets (Figure 10.2). This is significant in that the level of training and technical expertise available in such small establishments is likely to be low. Their response might, therefore, differ from that given by larger establishments.
Figure 10.1 Return of retail questionnaire by establishment size.

- 436 (41.9%) Small (<5 employees)
- 182 (17.5%) Medium (5-10 employees)
- 130 (12.5%) Large (11-50 employees)
- 229 (22.0%) Very Small (No employees)
- 62 (6.0%) Very Large (>51 employees)
- 1 (0.1%) Don't Know
Figure 10.2 Return of retail questionnaire by type of business.

759 (73.0%) Single independent

125 (12.0%) National chain

39 (3.8%) Area chain

72 (6.9%) Local chain

5 (0.5%) Not given

40 (3.8%) Other
Figure 10.3 illustrates the return of catering questionnaire by type of establishment. Some 235 (28.4%) restaurants returned questionnaires. A further 267 identified the establishment type as "other". Of this group, it was possible to identify 263 who had used the space provided to indicate that they were a public house or who had returned a compliment slip which identified that they were a public house. Although catering took place at these premises, the proprietor did not consider that they fell into the category of restaurant.

Some 270 (32.6%) caterers served 101 or more meals per day (Figure 10.4), however, nearly two thirds (64.9%) served 100 meals or less. Since smaller establishments are unlikely to provide the same level of resources and training as larger establishments, data were examined in order to identify any differences between establishment sizes.

Most, 524 (63.3%), prepared food by cook-to-order or traditional catering (51.9%). Smaller, but significant proportions also reheated pre-cooked (28%) and frozen (21.4%) foods (Figure 10.5). Only 14% indicated that they operated cook-freeze and 13.4% cook-chill.

The proportions indicating that they operated a cook-chill or cook-freeze system are inconsistent with those indicating that they reheated pre-cooked, chilled or frozen food. It seems likely that respondents may have been unfamiliar with the terms cook-chill and cook-freeze.
Figure 10.3 Return of catering questionnaires by establishment type.
Figure 10.4 The number of meals prepared per day by caterers.
Figure 10.5 Types of catering operation carried out by caterers.
The number of responses from the main establishment types within both the retail and catering sectors were considered adequate for comparison. Within the retail sector, only 39 questionnaires were returned by retailers who were part of an area chain. This quantity was below the minimum set for statistical purposes in the methodology. Within the catering sector, only 47 Industrial, 46 Hotels (<5 rooms) and 32 Educational establishments returned questionnaires. These categories were not used for statistical comparison unless pooled into groupings of establishment types containing 50 or more returns.

10.5 THE PERCEIVED RISKS AT RETAIL AND CATERING ESTABLISHMENTS

Respondents were asked to assess the potential risk of their business causing food poisoning using a 5-point scale from "no risk" to "very hazardous". For the purposes of analysis, respondents who indicated either "no risk" or "low risk" were pooled and considered to rate the risk as "low". Those who indicated "hazardous" or "very hazardous" were also pooled and were considered to rate the risk as "high". The important element in this question was the word potential. No matter how well controlled any operation is, there is always the potential for something to go wrong.

Retailers

The potential risk from the handling and sale of pre-packed, non-perishable foods is lower than that from perishable foods, which are likely to require careful temperature control. Where open, high risk
foods are involved there is also the potential for cross-contamination to occur.

In order to reflect this differing potential risk, the response to question 3 was used to identify premises selling one or more of the following products:

(a) Unwrapped cooked meats.
(b) Unwrapped soft cheese.
(c) Sandwiches.
(d) Cream cakes.
(e) Ready to eat meals.
(f) Prepared salads.

These foods were considered "high risk" because they would not be subject to cooking prior to consumption. Any temperature abuse or cross-contamination would, therefore, increase the risk of food related illness resulting from their consumption.

The responses from establishments selling one or more of these products were pooled into a "high risk" category and compared with those from retailers selling only "low risk" foods. It was expected, that the "high risk" businesses may have shown a greater awareness of the potential risks than "low risk", but no significant difference was found.
Overall, 783 (75.3%) retailers thought that the potential risk of their business causing food poisoning was "low" (Question 6). Only 87 (8.3%) considered the potential risk to be "high" (Figure 10.6).

An Audit Commission Survey in 1990 (Audit Commission 1990) concluded that 12.5% of open food retailers, and 9% of supermarkets presented a high risk. Against that background it is likely, therefore, that retailers in this study indicated the level of risk they perceived their business to present rather than the level of potential risk. Since 80% of retail establishments sold high risk foods, this finding indicates a lack of awareness of the potential risk in many retail outlets.

There was no significant difference in the potential risk identified by "very-small", "small", "medium", and "large" establishments. There was, however, a greater appreciation of the potential risks in "very large" establishments (>50 employees).

Data were examined to determine any differences in the appreciation of potential risk between respondents at different levels within retail businesses. The number of questionnaires returned by the store manager/manageress and department manager were too small for statistical comparison, however, there was no significant difference in the appreciation of the potential risks between respondents at other levels.
Figure 10.6 The perceived potential risk from retail businesses.

- 481 (46.3%) Low risk
- 302 (29.0%) No risk
- 157 (15.1%) Some risk
- 47 (4.5%) Hazardous
- 40 (3.8%) Very hazardous
- 13 (1.3%) Not given
Caterers

It was considered that caterers would have a greater appreciation of the potential risk associated with their business. Surprisingly, 582 (70.3%) caterers indicated there to be a "low" potential risk from the food they prepared. Only 95 (11.5%) thought there to be "high" potential risk (Question 6) (Figure 10.7). Given the greater number of hazards and the higher level of risk associated with catering, this response is surprising in that it is similar to that from retailers.

This may be the result of respondents answering the question in terms of the risk they perceived, rather than the level of potential risk. If this was the case, a larger proportion would have been expected to indicate a high risk, since a survey in 1990 (Audit Commission 1990) concluded that some 18% of takeaways, 17% of restaurants, 12.5% of hotels and 11% of pubs presented a high risk to food safety. Data from this study indicate a worrying lack of awareness of the potential risk associated with catering operations.

Data were examined to identify any differences in the perceived risk between establishment types, catering operation, or level of respondent.

In the case of establishment type a consistently low appreciation of potential risk was found, however, there was slightly greater awareness in hospital/institutional and industrial caterers. This difference was not statistically significant.
Figure 10.7 The perceived potential risk from food preparation carried out by caterers.

- 414 (50.0%) Low risk
- 131 (15.8%) Some risk
- 46 (5.6%) Hazardous
- 49 (5.9%) Very hazardous
- 20 (2.4%) Not given
- 168 (20.3%) No risk
No significant differences were found between types of catering operation, or between different positions of respondent. There was, however, a slightly increased awareness of the potential risk amongst catering managers/manageresses and in establishments preparing 501 or more meals per day.

The potential risk indicated by these results is slightly lower than the level of actual risk established by the Audit Commission in 1990. On the assumption that more responsible organisations and, therefore, better managed establishments would be more likely to return the questionnaire, the results indicate a worrying lack of awareness of the potential risks of food poisoning arising from catering operations.

10.6 THE PERCEIVED CAUSES OF FOOD POISONING

Respondents were asked to rank in priority, from 1 to 6, the cause of the greatest number of cases of food poisoning in England and Wales (1 indicating the highest number of cases caused and 6 the least). Whilst a variety of factors may be implicated in cases of food poisoning, previous studies have identified factors contributing to outbreaks of food poisoning. In particular, inadequate temperature control is the major contributing factor (Roberts 1982) (Bryan 1988).

For the purposes of this study, respondents giving a rating of 1 or 2 for a factor were considered to recognise it as a "major" cause of food poisoning (Question 13). Using this criterion, the perceived
importance of causes were examined and compared to the real causes of outbreaks identified in previous studies.

In using such a basis for comparison, it is acknowledged that the causes in previous studies relate to outbreaks of food poisoning rather than sporadic cases. This was identified in Chapters 6 and 7.

Further, the comparison is based on the assumption that if food handlers are aware of the causes of food poisoning they are more likely to avoid bad practices than those who are unaware. Awareness may depend heavily on the level of training.

Differences between groups were, therefore, examined to identify effects due to training.

Retailers

Nearly half of the retailers questioned (47.7%) considered inadequate temperature control to be a major factor leading to food poisoning (Table 10.1).

Refrigeration is essential in most retail food outlets, in order to preserve and maintain the shelf-life of perishable foods. The level of awareness of the need for good temperature control was, therefore, lower than expected. This level is comparable to that among the general adult population. A survey of 1927 adults in 1988 (MAFF 1988), showed that some 18% recognised the danger of keeping food at room temperature. In
Table 10.1  Retailers Perception of the Importance of Factors as Causes of Food Poisoning

<table>
<thead>
<tr>
<th>Factor</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Inadequate Temperature Control</td>
<td>294</td>
</tr>
<tr>
<td>Inadequate Hygiene training</td>
<td>101</td>
</tr>
<tr>
<td>Cross - Contamination</td>
<td>285</td>
</tr>
<tr>
<td>Poor or inadequate Personal Hygiene</td>
<td>127</td>
</tr>
<tr>
<td>Inadequate Cleaning/Disinfection</td>
<td>90</td>
</tr>
<tr>
<td>Pest Infestation</td>
<td>122</td>
</tr>
</tbody>
</table>

KEY:  1 = Highest number of cases caused
      6 = Lowest number of cases caused
addition, 53% identified inadequate thawing and 50% thawing and refreezing food as causes of food poisoning. Given that this sample was from the population at large, it was expected that persons working in the food trade would have had a significantly greater level of awareness.

Since some of the retailers may only have sold low risk foods, data were examined to identify any greater level of awareness of the importance of temperature control within establishments selling high risk foods (as previously defined).

Some 80.6% of retailers indicated that they sold "high risk" food/s. No significant difference in the recognition of temperature control, as a major factor leading to food poisoning, was found between this group and other establishments.

Only 24.6% of retailers selling "high" risk foods ranked temperature control as a major cause. Perhaps more worrying was the fact that 29.7% ranked inadequate temperature control as a minor cause. This finding is significant in that it indicates a fundamental lack of appreciation of the major factor implicated in outbreaks of food poisoning.

Data were examined for any differences between respondents' at different positions within businesses and between establishments with different levels of staff training. No significant differences were found at the 5% level.
Some 494 (47.5%) thought cross-contamination to be a major factor. This is interesting, in that cross-contamination is commonly emphasised as being a major cause. In practice, however, it has been implicated as a contributing factor in 5.9% of outbreaks in England and Wales (Roberts 1982) and in 3.8% of outbreaks in the USA (Bryan 1988). Such figures may, however, be misleading. Whilst cross-contamination alone may not be sufficient to cause food poisoning, if it is followed by inadequate temperature control, then sufficient bacterial growth may occur to result in food poisoning. In such cases it is often easier to identify inadequate temperature control as the contributing factor.

Significantly lower proportions of respondents considered the other factors to be major causes of food poisoning. Some 26.6% identified inadequate personal hygiene as a major cause. This factor is important to food safety, not just to prevent cross-contamination but also because food handlers may be colonised or infected by food poisoning organisms which could be passed on to food. Roberts (1982) identified infected food handlers as a contributing factor in 5.2% of outbreaks in England and Wales between 1970 and 1979. Bryan (1988) found that colonised persons handled implicated foods in 15.1% of outbreaks in the USA between 1961 and 1982.

Some 25.3% thought inadequate cleaning and disinfection to be a major cause. Bryan (1988) found that improper cleaning of equipment/utensils to be a contributing factor in 3.8% of outbreaks.
Overall, the findings indicate that there is a lack of awareness of inadequate temperature control as a major cause of outbreaks of food poisoning and a lack of appreciation of the need to maintain good temperature control. There is, therefore, a need to raise the level of awareness of this and other factors which are critical to good food safety practices. The effect of training on awareness of these factors is considered further in Chapter 11.

Caterers

Some 430 (51.9%) of caterers considered inadequate temperature control to be a major cause of food poisoning (Table 10.2). It was expected that there would be a greater awareness of the causes of food poisoning amongst caterers than amongst retailers, however, the difference was not significant.

Data were also examined for any differences, in the appreciation of inadequate temperature control as a major cause of food poisoning, between establishment types, the number of meals prepared, the type of catering operation or the position of the respondent within the business. No significant differences were found.

A high proportion of caterers (56.3%) thought cross-contamination to be a major factor. It was expected, given the extensive handling of open food in catering operations, that there would be a greater awareness of this as a major factor. As previously highlighted, however, the proportion of outbreaks where this has been identified in the literature
Table 10.2 Caterers Perception of the Importance of Factors as Causes of Food Poisoning

<table>
<thead>
<tr>
<th>Factor</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Inadequate Temperature Control</td>
<td>230</td>
</tr>
<tr>
<td>Inadequate Hygiene training</td>
<td>85</td>
</tr>
<tr>
<td>Cross Contamination</td>
<td>279</td>
</tr>
<tr>
<td>Poor or inadequate Personal Hygiene</td>
<td>54</td>
</tr>
<tr>
<td>Inadequate Cleaning/Disinfection</td>
<td>38</td>
</tr>
<tr>
<td>Pest Infestation</td>
<td>40</td>
</tr>
</tbody>
</table>

KEY: 1 = Highest number of cases caused
6 = Lowest number of cases caused
as a contributing factor is small in comparison to inadequate temperature control. Nevertheless, it is clearly an extremely important factor in premises where open food is being handled.

As amongst the findings in the retail sector, significantly lower proportions of caterers considered the other factors to be major causes of food poisoning. Only 19.8% considered poor or inadequate personal hygiene to be a major factor, 15.8% inadequate cleaning and disinfection and only 12.6% pest infestation. These proportions are lower than amongst the retail sector.

Only 19.1% considered inadequate hygiene training to be a major cause. More significantly, 33.9% thought it to be of low importance.

It is widely considered that training is an important factor in food safety (Richmond 1991). Indeed, knowledge of the factors contributing to food poisoning imparted through training could have influenced the response to this question. Data were, therefore, examined in order to identify any differences due to increased levels of training. Respondents who had a formal qualification in food safety were compared to those who did not. No significant difference in the rating of inadequate temperature control as a major cause of food poisoning was found.

To examine the effect of training further, data from establishments where over 50% of the staff had obtained one or more formal
qualification were grouped as "trained". These were then compared to those where there was no training.

Within the "trained" group 56% considered inadequate temperature control and 63.2% cross-contamination to be "major" causes of food poisoning. Amongst establishments where the staff were "untrained" 41.1% considered inadequate temperature control and 42.4% cross-contamination to be "major" causes. In establishments where over 50% of the staff had formal training there was, therefore, a greater appreciation of the causes of food-related illness.

Given the level of risk associated with catering operations the results indicate a worrying lack of appreciation of temperature control as a major cause of outbreaks of food poisoning. There is, therefore, a need to raise the level of awareness of this and other factors which are critical to good catering practice.

In establishments with a high level of training there was a significantly greater awareness of inadequate temperature control as a cause. It is unclear whether this is solely the result of training or whether it is due largely or in part to the "culture" and management of those establishments. The effect of training on the level of awareness is, therefore, considered further later in this Chapter and is the subject of a further study described in Chapter 11.
10.7 EFFECTS OF THE ACT ON FOOD BUSINESSES

This study took place between January and April 1993 some two years after the Act came into force. Articles in national newspapers and trade magazines suggested that the Act had introduced major changes, with substantial practical and financial implications for food businesses. After 2 years these implications would have been appreciated by most businesses. It was expected, therefore, that a high proportion of retailers and caterers would indicate that the Act had had a significant effect on them.

Retailers

Some 384 (36.9%) of retailers thought that the Act had resulted in either "considerable" or "major" effects (Question 4)(Figure 10.8). A further 399 (38.4%) thought that it had "some" effect on them, but 239 (23%) thought that it had "little effect" or "no effect".

There was a significant difference between owners and store managers. Only 20.9% of owners thought that the Act had had a "considerable" or "major" effect on them whereas 33.8% of store managers/manageresses considered this to be the case.

This suggests that the impact of the Act has been greater on operational practices. The manager/manageress would have greater involvement with these, whereas, the owner would be more likely to become involved in instances where additional financial costs were incurred. For example,
Figure 10.8 The effects of the Food Safety Act 1990 on retailers.

- 150 (14.4%) Major
- 46 (4.4%) None
- 193 (18.6%) Little
- 399 (38.4%) Some
- 234 (22.5%) Considerable
- 18 (1.7%) No answer
in the purchasing of new equipment or capital expenditure on premises. This suggests that the effect of the Act on retailers was more significant in altering work systems, such as temperature control and monitoring, than it was financially.

This finding is supported by the fact that 62% of retailers indicated that inspection of their premises had been followed up with either a verbal or written report, but only 14.6% had received INs (Question 19). Enforcement guidance contained in Statutory Code of Practice No.5 (HMSO 1991") advised LAs to use INs in order to remedy breaches of legislation. The findings of the study indicate that major changes were not required, since had this been the case, a greater use of INs and/or other follow up action, such as prosecution, would have been expected.

Data was examined to identify any differences between retailers selling high risk foods and those selling only low risk foods. There was no significant difference in the proportions who considered the Act to have had a "considerable" or "major" effect.

Some 38% of "very large" establishments employing 11 or more employees considered the impact to be "considerable" or "major" compared to only 19.6% in "small" to "medium" sized establishments. This significant difference is likely to be due, at least in part, to the order of scale of the businesses concerned.
The Act introduced the use of INs as a new enforcement power. At the time of the study these were advocated as the first enforcement choice to remedy contraventions of regulations. Subsequently, EHOs have received extensive criticism for the "over zealous" use of these notices and excessive requirements detailed within them. It is interesting, therefore, that 73.2% of retailers found INs to be "effective" or "very effective" in making them carry out any necessary remedial measures (Question 15)(Figure 10.9). It would seem, therefore, that although there may be a need for much closer control to achieve a uniformity of requirements within INs, the actual concept of them as an enforcement tool is accepted by the trade as being effective. Indeed, nearly two thirds (66.1%) of all retailers felt that INs were "effective" or "very effective" in preventing food poisoning and only 2.2% thought that they were not effective in doing so (Question 19)(Table 10.3). This contrasts sharply with Government policy set out in the revised Statutory Code of Practice No.5 which directs LAs away from the use of INs as a first course of enforcement action.

Other new powers within the Act, including EPNs and POs, have been described in Chapter 8. Retailers views on the effectiveness of these provisions are detailed in Table 10.3.

Some 55.7% (580) thought that EPNs were "effective" or "very effective" in preventing food poisoning. Given that such notices are used only in circumstances where there is "serious imminent risk of injury" it is considered that this procedure represents a very powerful means of preventing cases of food poisoning and it was expected that a higher
Figure 10.9 Retailers views on the effectiveness of Improvement Notices

- Very effective: 399 (38.4%)
- Effective: 362 (34.8%)
- Not given: 51 (4.9%)
- No effect: 43 (4.1%)
- Not very effective: 185 (17.8%)
Table 10.3  Retailers views on the effectiveness of legal provisions within The Food Safety Act 1990 in preventing food poisoning.

<table>
<thead>
<tr>
<th>LEGAL PROVISION</th>
<th>Very Effective</th>
<th>Effective</th>
<th>Some Effect</th>
<th>Not Effective</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement Notices</td>
<td>297 (28.6%)</td>
<td>338 (32.5%)</td>
<td>165 (15.9%)</td>
<td>23 (2.2%)</td>
<td>217 (20.8%)</td>
</tr>
<tr>
<td>Emergency Prohibition Notices</td>
<td>356 (34.2%)</td>
<td>224 (21.5%)</td>
<td>115 (11.1%)</td>
<td>23 (2.2%)</td>
<td>322 (30.9%)</td>
</tr>
<tr>
<td>Prohibition Orders</td>
<td>325 (31.3%)</td>
<td>235 (22.6%)</td>
<td>106 (10.2%)</td>
<td>26 (2.3%)</td>
<td>348 (33.4%)</td>
</tr>
<tr>
<td>Due Diligence Defence</td>
<td>214 (20.6%)</td>
<td>243 (23.4%)</td>
<td>158 (15.2%)</td>
<td>31 (3.0%)</td>
<td>236 (37.9%)</td>
</tr>
</tbody>
</table>
proportion would indicate that this power was effective. Nevertheless, only 2.2% (23) thought that such notices were "not effective".

A similar proportion, some 54% (560), thought that POs were effective in preventing food poisoning. The purpose of POs is to prohibit irresponsible, convicted proprietors from operating a food business. As in the case of EPNs it was expected that a higher proportion would have indicated these to be effective. This response may indicate that many retailers were unsure as to the nature and purpose of EPNs and POs.

At the time of the study only 195 EPNs had been served on retailers and 333 on caterers in England and Wales (MAFF 1992) (MAFF 1993). Since this represents a maximum of 0.1% of retailers and 0.12% of caterers it is unlikely that many of the proprietors responding to the questionnaire would have had any first hand experience of the use of either EPNs or POs. It seems likely that many respondents answered this question in the way that they felt was expected.

The statutory defence of due-diligence has been widely documented in trade journals and it was considered that retailers would be familiar with this concept as it has considerable implications for them. Some 44% (457) thought that due-diligence was effective in reducing food poisoning.

Richmond (1991) recommended the introduction of a licensing system for food premises. An enabling power was included within Section 47 of the Act, permitting the Minister to make regulations. The Government argued
strongly that a licensing system was not needed and would be over-burdensome on business. Instead it introduced regulations for the registration of food premises in 1991 (HMSO 1991\(^1\)). This decision has been widely criticised and licensing systems in other countries such as the USA and Australia have been cited as examples where such a system is effective in controlling standards of food safety. It is, therefore, interesting to note that some 53.7% (558) of retailers considered that a licensing system for food premises would improve food safety and would help to reduce the incidence of food poisoning (Question 18) (Figure 10.10). Only 25.4% (264) thought that this would not be the case. The view of the retail trade would, therefore, seem to be at variance with that of the Government.

Caterers

Some 40.3% (334) of caterers thought that the Act resulted in either "considerable" or "major" effects (Question 4) (Figure 10.11). A further 38.5% (319) thought that it had "some effect" on them, but 19.1% (158) considered the Act to have had "little" or "no effect". This response is similar to that within the retail sector.

As was the case in retail establishments there was a significant difference between respondents in different positions within the company. Only 15.2% of owners thought the effect of the Act to be significant, whereas 25.7% of managers/manageresses, 23.6% of catering managers/manageresses and 45.5% of hygiene/safety officers felt it to be so. Although the sample size of hygiene/safety officers responding was
Figure 10.10 Retailers views on whether a licensing system for food premises would help to prevent food poisoning.

- 558 (53.7%) Yes
- 218 (21.0%) Don't know
- 264 (25.4%) No
Figure 10.11 The effects of the Food Safety Act 1990 on caterers.

- 194 (23.4%) Considerable
- 140 (16.9%) Major
- 319 (38.5%) Some
- 134 (16.2%) Little
- 17 (2.1%) No answer
- 24 (2.9%) None
below the minimum level set out in the methodology, there was a significant difference between the owners of catering establishments and other positions within the catering business.

This response is similar to that from retailers. It supports the view that the effects of the Act have been more significant in terms of changing working practices than in the need for additional financial expenditure.

Data were examined to identify any differences in the response between different establishment types, the number of meals prepared per day, or the types of food operation. For statistical purposes, only groups where 50 or more responses had been received were used for comparison, but no significant differences were found.

In the majority of cases (62.5%), inspection had been followed up either verbally or by letter. Only in 14.1% of cases had it been followed up with an IN. This supports the conclusions drawn from the retail questionnaire, that in most cases major changes to the business were not required. Had this been the case it would have been indicated by a higher proportion of businesses receiving INs. It may also suggest that reports of over-zealous or over-burdensome enforcement are the exception rather than the rule and that exaggerated incidents may have been reported.
As was the case with retailers, most caterers (60.3%) considered INs to be an effective way of ensuring that they carried out any remedial measures necessary (Question 20)(Figure 10.12).

Due to an error in the final printing of the catering Questionnaire the question on licensing and its effectiveness in preventing food poisoning was not included and, therefore, it was not possible to examine caterers views on this subject.

10.8 TEMPERATURE CONTROL

Retailers

Some 94.4% of all retailers thought that temperature control was either "important" or "very important" to the safe operation of their business (Question 5)(Table 10.4). This is interesting, since only 47.7% thought that temperature control was the "major" factor leading to food poisoning (Question 13). Although, therefore, most recognise it as being important to their business, its importance in controlling food poisoning does not seem to be as well understood.

There was no significant difference in the recognition of the importance of temperature control between respondents from different positions within companies (Q5 x Q20).

It was expected that the size of the company, the level of training, and the sale of "high risk" perishable foods requiring refrigeration may
Figure 10.12 Caterers views on the effectiveness of Improvement Notices

- 416 (50.2%) Effective
- 84 (10.1%) Very effective
- 23 (2.8%) No answer
- 25 (3.0%) No effect
- 280 (33.8%) Not very effective
Table 10.4  Retailers view on the importance of hygiene factors to the safer operation of their business.

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>LEVEL OF IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Important</td>
</tr>
<tr>
<td>Temperature Control</td>
<td>797 (76.6%)</td>
</tr>
<tr>
<td>Pest Control/Prevention</td>
<td>729 (70.1%)</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>826 (82.9%)</td>
</tr>
<tr>
<td>Hazard Analysis Critical Control</td>
<td>266 (25.6%)</td>
</tr>
<tr>
<td>Premises Structure</td>
<td>294 (28.3%)</td>
</tr>
<tr>
<td>Washing Facilities</td>
<td>645 (62.0%)</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>675 (64.9%)</td>
</tr>
<tr>
<td>Staff Training in Hygiene</td>
<td>620 (59.6%)</td>
</tr>
<tr>
<td>Stock Rotation</td>
<td>814 (78.3%)</td>
</tr>
</tbody>
</table>
affect the perception of temperature control as being important. There was however, no significant difference as a result of any of these factors.

Some 69.2% of retailers indicated that their staff had received in-house training on temperature monitoring and 63.4% on temperature control (Question 11)(Figure 10.19).

The level of in-house training in both temperature monitoring and temperature control was significantly lower in "small" or "very small" establishments than in "medium" to "very large" establishments (Q1 x Q11). This difference is likely to be the result of the additional resources and expertise available in larger establishments. This conclusion is supported by the fact that there was also a significantly lower level of training in "single outlets" or "local" retail chains, than in "area" or "national" chains.

A high proportion of premises (83.3%) had either a written or unwritten temperature monitoring system in place (Question 7)(Table 10.10). Some 54.5% had a written system. Slightly higher proportions, 87.8% and 60% respectively, were observed in premises selling high risk foods. These differences were not significant.

A significantly lower proportion of "small" or "very small" retailers used written or unwritten systems for temperature monitoring than did "medium" to "very large" size establishments (Q1 x Q7). Similarly, amongst single outlets or local chains a lower proportion used written
or unwritten systems for temperature monitoring than in area or national chains.

The temperature of food in refrigerated units was checked daily or more frequently by 78.7% of retailers. Only 7.7% indicated that the temperature was not checked at all (Figure 10.13).

Amongst retailers selling high risk foods, a slightly higher proportion (85%), checked temperatures in refrigerator units daily or more frequently. Only 2.7% of this group did not check temperatures at all. Daily or more frequent temperature checks were less likely to be carried out in "small" or "very small" establishments, but the difference between this group and larger premises was not significant. These proportions are encouraging, but are they a true reflection of what happens in practice? They must be considered in the context of the lower proportion of establishments which have an appropriate temperature measuring device and the effectiveness of such monitoring. This will depend on the method of monitoring and the standards and action set out in a written monitoring system.

Some 55% of retailers kept written reports of food temperature checks (Question 17). This corresponds closely with the proportion who indicated that they had a written system for food temperature monitoring (54.5%) (Question 7).

In establishments selling high risk foods there was a greater likelihood of written records being kept (61.9%). "Small" or "very small"
Figure 10.13 The frequency at which retailers check the temperature of food in refrigerator units

- 362 (34.8%) Daily
- 76 (7.3%) Weekly
- 13 (1.3%) Fortnightly
- 21 (2.0%) Monthly
- 80 (7.7%) Not given
- 31 (3.0%) Other
- 457 (43.9%) More than once per day
establishments were significantly less likely to keep written records than larger establishments. "Single independent" retailers and retailers who were "part of a local chain" were also less likely to keep written records. This is not surprising, since smaller units are likely to have a smaller number of refrigeration units to check and because of lower staffing levels are less likely to use resources to keep such records.

Whilst 78.7% of retailers said that they checked refrigerator temperatures daily or more frequently (Figure 10.13), only 42.5% of retailers possessed an electronic thermometer with which to undertake such monitoring (Figure 10.14). This indicates that in most cases it is the refrigerator temperature which is being checked rather than the food temperature. Although it is encouraging that checking is being carried out it would seem that Government advice to the trade (HMSO 1992") is not being followed, even though some 69.2% of the sample thought that they complied with the Guidelines.

There would, therefore, seem to be either a lack of awareness of the detail of the guidance, or that whilst aware of it retailers have difficulty in funding the purchase of an electronic thermometer.

Only a slightly higher proportion (48.1%) of establishments selling high risk foods had an electronic thermometer for temperature monitoring. The size and type of establishment were significant factors in determining whether or not an electronic thermometer was used. "Small" or "very small" retailers were significantly less likely to have an
Figure 10.14 Types of thermometer used by retailers to monitor food temperatures.
electronic thermometer than "medium" to "very large". "Single independent" retailers or retailers who were "part of a local chain" were less likely to have an electronic thermometer than retailers who were part of an "area" or "national" chain.

It is encouraging that such a high proportion of retailers recognised the importance of refrigeration to their business. However, since the recognition of inadequate temperature control as a cause of food related illness was significantly lower, this indicates that the importance of temperature control to retailers is the result of economic rather than food safety considerations.

The level of temperature monitoring, particularly in establishments selling perishable high risk food is encouraging. In practise it would seem that it is the temperature of the refrigeration unit that is checked rather than the temperature of the food. This is indicated by the low level of retailers with an electronic thermometer.

The guidelines on temperature monitoring specify monitoring equipment and methods. The difference between the level of retailers who thought they complied with the guidance and those who indicated that they had the correct equipment to do so suggests that there is a lack of awareness of the guidance. This could be significant, in that temperature checks may as a consequence be rather cursory, may be taken at inappropriate positions and may not be representative of the overall unit or food temperatures. This is particularly likely in large refrigeration units where considerable spatial temperature variation can
occur. In this respect, only 55.5% of retailers kept written records and they would, therefore, have difficulty in establishing temperature trends. They would also have difficulty in establishing a "due diligence" defence. Since temperature control would be a critical control point for many foods, it also indicates that HACCP principles are not being properly applied.

Only 28.3% of retailers considered inadequate temperature control to be the greatest cause of food related illness (Table 10.1). For the purpose of the study respondents who ranked temperature control as either priority 1 or 2 were considered to recognise it as a "major" cause of food poisoning. This group was then be used for comparison with others.

Overall, some 47.7% (496) of retailers considered temperature control to be a "major" cause of food poisoning. It was anticipated that the level of awareness of temperature control may be dependant on the size of establishment, the type of establishment, the types of food being sold and the position within the organisation of the person completing the questionnaire. Cross-tabulations of data were, therefore, undertaken in order to identify any differences.

There was variation between establishments of different size. In "very small" establishments, 45% (103) recognised inadequate temperature control to be a "major" cause of food poisoning. This proportion increased with size of establishment, to some 56.5% (35) in the case of "very large" businesses (Table 10.5).
Table 10.5  The importance of temperature control as a factor leading to cases of food poisoning as perceived by different sized retail establishments.

<table>
<thead>
<tr>
<th>Size of retail Establishment</th>
<th>LEVEL OF IMPORTANCE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not given</td>
<td>1</td>
</tr>
<tr>
<td>Not Given</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Very Small</td>
<td>35</td>
<td>62</td>
</tr>
<tr>
<td>Small</td>
<td>39</td>
<td>119</td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Large</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Very Large</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>294</td>
</tr>
</tbody>
</table>

Key  1 = Highest number of cases of food poisoning caused
     6 = Lowest number of cases of food poisoning caused
In establishments where high risk foods were retailed there was no significantly greater awareness of temperature control as a cause of food poisoning. Some 50% (363) recognised inadequate temperature control as a "major" cause.

It is encouraging that such a high proportion of retailers recognised the importance of refrigeration to their business, however, the recognition of inadequate temperature control as a cause of food-related illness was significantly lower. This supports the view that retailers perception of the importance of temperature control is the result of economic rather than food safety considerations.

Caterers

Most caterers (95.8%) considered temperature control to be "important" to the safe operation of their business (Question 5) (Table 10.6). Only a small proportion, some 1.6%, indicated it to be "very unimportant" or "irrelevant". This is very encouraging.

Some 87.6% of caterers had a temperature monitoring system, and in 59% this was a written system (Question 7) (Table 10.7). These proportions show good correlation with the response to Question 14 in which 59.4% of establishments indicated that they kept written temperature records.

The temperature of refrigerated foods was checked daily or more frequently by 83% of caterers (Figure 10.15). Some 41.9% checked temperatures twice daily or more frequently (Question 10). Although
Figure 10.15 The frequency at which caterers check the temperature of food in refrigerator units

- 340 (41.1%) Daily
- 65 (7.9%) Weekly
- 11 (1.3%) Fortnightly
- 17 (2.1%) Monthly
- 74 (8.9%) Continually
- 188 (22.7%) Twice daily
- 85 (10.3%) More than twice daily
- 30 (3.6%) Not checked
- 18 (2.2%) Not given
Table 10.6 Caterers views on the importance of hygiene factors to the safe operation of their business.

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>LEVEL OF IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Important</td>
</tr>
<tr>
<td>Temperature Control</td>
<td>662 (80.0%)</td>
</tr>
<tr>
<td>Pest Control/Prevention</td>
<td>572 (69.1%)</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>700 (84.5%)</td>
</tr>
<tr>
<td>Hazard Analysis Critical Control</td>
<td>263 (31.9%)</td>
</tr>
<tr>
<td>Premises Structure</td>
<td>227 (27.4%)</td>
</tr>
<tr>
<td>Washing Facilities</td>
<td>525 (63.4%)</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>557 (67.3%)</td>
</tr>
<tr>
<td>Staff Training in Hygiene</td>
<td>583 (70.4%)</td>
</tr>
<tr>
<td>Stock Rotation</td>
<td>552 (66.7%)</td>
</tr>
</tbody>
</table>
Table 10.7  The types of work system being operated by caterers.

<table>
<thead>
<tr>
<th>WORK SYSTEM</th>
<th>No System</th>
<th>Written</th>
<th>Not Written</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Rotation</td>
<td>104</td>
<td>238</td>
<td>486</td>
</tr>
<tr>
<td></td>
<td>(12.6%)</td>
<td>(28.5%)</td>
<td>(58.7%)</td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td>103</td>
<td>488</td>
<td>237</td>
</tr>
<tr>
<td></td>
<td>(12.5%)</td>
<td>(59.0%)</td>
<td>(28.6%)</td>
</tr>
<tr>
<td>Staff Training</td>
<td>132</td>
<td>388</td>
<td>308</td>
</tr>
<tr>
<td></td>
<td>(15.9%)</td>
<td>(46.9%)</td>
<td>(37.2%)</td>
</tr>
<tr>
<td>Dealing with Consumer Complaints</td>
<td>177</td>
<td>305</td>
<td>346</td>
</tr>
<tr>
<td></td>
<td>(21.4%)</td>
<td>(36.8%)</td>
<td>(41.8%)</td>
</tr>
<tr>
<td>Cleaning/Disinfection</td>
<td>79</td>
<td>437</td>
<td>312</td>
</tr>
<tr>
<td></td>
<td>(9.5%)</td>
<td>(52.8%)</td>
<td>(37.7%)</td>
</tr>
<tr>
<td>Pest Prevention Programme</td>
<td>145</td>
<td>374</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td>(17.5%)</td>
<td>(45.2%)</td>
<td>(37.3%)</td>
</tr>
<tr>
<td>Hazard Analysis (HACCP)</td>
<td>298</td>
<td>231</td>
<td>299</td>
</tr>
<tr>
<td></td>
<td>(36.0%)</td>
<td>(27.9%)</td>
<td>(36.1%)</td>
</tr>
<tr>
<td>Quality Assurance</td>
<td>141</td>
<td>240</td>
<td>447</td>
</tr>
<tr>
<td></td>
<td>(17.0%)</td>
<td>(29.0%)</td>
<td>(54.0%)</td>
</tr>
</tbody>
</table>
42.6% checked the temperature of hot-held food on a daily or more frequent basis, over half (57.4%) undertook no check at all.

The proportion of premises where a written temperature monitoring system was in operation (59%) was higher than expected. However, the question did not identify the extent or effectiveness of the system. Moreover, the proportion who checked chilled food temperatures twice or more a day was lower (41.9%) and over half (57.4%) undertook no hot food temperature checks at all. Given that only 57.9% had an electronic thermometer with which to check temperatures it seems likely that respondents may have answered the question the way they felt they should rather than giving a factual reply (Question 8) (Figure 10.16). There is, therefore, doubt as to whether the temperature monitoring being carried out is adequate. In addition, there is inadequate awareness of the guidance procedures (HMSO 1992" and Code of Practice No.10 (HMSO 1991³).

Data were examined for differences between types of establishment (Q1 x Q10) or between types of catering operation (Q3 x Q20). No significant differences in the frequency of temperature monitoring was found. However, a significantly higher level of monitoring of hot food temperatures took place in industrial and educational establishments and this could reflect an increased level of training and greater financial resources in such organisations.
Figure 10.16 Types of thermometer used by caterers to monitor food temperatures.

- Liquid crystal device (187)
- Electronic (376)
- Refrigerator dial (238)
- Glass mercury (201)
- Other (26)
- None (79)
10.9 HACCP

Although the concept of HACCP has been advocated for many years it has not been widely adopted within the catering or retail sectors of the food trade. Only relatively recently has it started to receive greater publicity. It was considered, therefore, that many, particularly in the retail sector, would be unfamiliar with the concept and even the term itself. This assumption is certainly born out by personal experience in food safety inspection. Knowledge of HACCP tends to be restricted to those who have undergone higher level food safety training and even among this group the name or general concept may be familiar but the detail is not. Mention of HACCP generally results either in a blank look or enthusiastic acknowledgement, often unwarranted as little more is known.

It was expected, therefore, that the response to this question could be affected by subjective influences and that many respondents may indicate that they thought HACCP to be important either because they felt this was the answer they should give, or because they thought they knew what it was. For this reason, further separate questions were included in the questionnaire in order to indicate whether elements of HACCP were being put into practice.

Although not essential, it is important that good catering practice is in operation before HACCP is implemented. For this reason, questions on work systems and records were included in the questionnaire to provide an indication of the extent to which this was happening.
Respondents were asked to assess the importance of HACCP to the safe operation of their business on a scale of importance from "irrelevant" to "very important". For the purposes of analysis, those who indicated that it was "important" or "very important" were pooled in one group termed "important", and those who thought it to be either "very unimportant" or "irrelevant" pooled to a group termed "unimportant". On this basis, over half (57.7%) of the retailers thought that HACCP was "important" to the safe operation of their business, whilst 13.3% thought it to be "unimportant" (Question 5) (Table 10.4).

Whilst this is encouraging, the proportion who considered it to be "important" was significantly lower than any of the other factors, whilst the proportion who thought it "unimportant" was significantly higher than those other factors.

A significantly higher proportion of store managers/manageresses considered HACCP to be "important" than did owners (Q5 x Q20) (Table 10.8). Only 52.2% of owners thought it to be important whilst 78.9% of store managers/manageresses thought this to be the case. Further, a greater proportion of store owners (15.4%) thought it to be unimportant than did managers/manageresses (5.1%). Managers/Manageresses are likely to have more food safety training than owners and this may be reflected in the answers given. This difference was also identified in other areas within the study, for example, in the effects of the Act.
Table 10.8 Scale of importance of HACCP in the safe operation of retail establishments as perceived by different levels of staff.

<table>
<thead>
<tr>
<th>Position within the Company</th>
<th>VERY IMPORTANT</th>
<th>IMPORTANT</th>
<th>NOT Important</th>
<th>VERY Unimportant</th>
<th>Irrelevant</th>
<th>No Answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>166</td>
<td>248</td>
<td>94</td>
<td>6</td>
<td>116</td>
<td>162</td>
<td>792</td>
</tr>
<tr>
<td>Store Manager</td>
<td>53</td>
<td>71</td>
<td>10</td>
<td>1</td>
<td>7</td>
<td>15</td>
<td>157</td>
</tr>
<tr>
<td>Department Manager</td>
<td>21</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Hygiene/Safety Officer</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>16</td>
<td>21</td>
<td>1</td>
<td>6</td>
<td>5</td>
<td>56</td>
</tr>
</tbody>
</table>
Given the importance of HACCP principles to retailers selling, handling or preparing high risk foods it was considered that a higher proportion within this group may have regarded it as "important". There was, however, no significant difference between establishments selling or preparing high risk foods compared to those who did not.

Data were examined to determine if the size of a business had an effect on the rating of the importance of HACCP. As the size of the business increased, so too did the rating of importance. Some 52.1% of "small" retailers thought HACCP to be "important" but this proportion rose consistently to 80.8% in retail outlets who were part of a "national chain".

The level of training was also considered to be a factor which could influence how HACCP was assessed. Overall, only 20.5% of retailers indicated that staff had received in-house training on HACCP. Although this proportion is higher than expected, it is nevertheless, significantly lower than any of the other subjects in which training was provided.

Comparison between establishments who had trained their staff and those who had not indicated a significant difference in the assessment of HACCP. In those who had provided training on HACCP, 64.4% thought it to be "important" as compared to 43.2% in those who had not (Q5 x Q11)(Table 10.9). It was unclear from these results whether the increase was due purely to training, or whether the "culture" of the business was equally important.

260
Table 10.9  Assessment of the importance of HACCP in establishments where in house staff training in HACCP provided.

<table>
<thead>
<tr>
<th>Type of Staff</th>
<th>LEVEL OF IMPORTANCE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Important</td>
<td>Important</td>
</tr>
<tr>
<td>Trained</td>
<td>217 (30.1%)</td>
<td>247 (34.3%)</td>
</tr>
<tr>
<td>Untrained</td>
<td>37 (14.8%)</td>
<td>71 (28.4%)</td>
</tr>
</tbody>
</table>
In order to examine the effect that formal qualifications may have had, the perceived importance of HACCP was examined against the qualification of the respondent returning the questionnaire. Because of the low overall level of formal qualifications amongst respondents, it was necessary to pool equivalent qualifications together into appropriate groupings in order to provide data cells with more than 50 responses. These data cells were then used for comparison. For this purpose the following three groupings were examined:

1. A higher level group containing Degree, City and Guilds, and the IEHO Advanced Certificate courses.
3. A basic group containing the IEHO Basic and Intermediate Certificates.

It was expected, that a greater proportion of those in the higher qualification group (1) would have rated HACCP as "important". However, no significant difference in the perceived importance of HACCP was found between these groups.

Respondents may have indicated that they thought HACCP to be "important" because they considered this was the answer expected. Conversely, some may have indicated it to be "unimportant" because they were unfamiliar with the term although they may be applying some of its principles in practice.
The presence of written work systems or records for stock rotation, cleaning and disinfection, temperature monitoring, and pest prevention were considered to be provide an indication of good operating practice which is important if a HACCP type of approach is to be adopted.

To test that respondents were consistent in their answers, responses to questions concerning work systems and records were compared. The proportion of retailers who indicated that they had written work systems (Question 8) and those indicating that they maintained written records (Question 17) were very similar. The proportion of retailers having written work systems for a variety of factors is illustrated in Table 10.10.

Whilst some 57.7% of retailers indicated that they thought HACCP to be "important", a much lower proportion indicated that they had written work systems and written records for temperature monitoring, cleaning and disinfection and pest control. This would imply either that respondents rated the importance of HACCP according to that which they thought was expected, or, that whilst recognising the importance of HACCP to their business, they had failed to implement this approach in practice. It is important that good hygiene practices are in operation before HACCP is applied. The low level of retailers having written work systems and records is of concern, as it indicates that adequate practices may not be in place.
Table 10.10  The types or work system being operated by retailers.

<table>
<thead>
<tr>
<th>WORK SYSTEM</th>
<th>No System</th>
<th>Written</th>
<th>Not Written</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock Rotation</td>
<td>145</td>
<td>253</td>
<td>642</td>
</tr>
<tr>
<td></td>
<td>(13.9%)</td>
<td>(24.3%)</td>
<td>(61.7%)</td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td>173</td>
<td>567</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>(16.7%)</td>
<td>(54.5%)</td>
<td>(28.8)</td>
</tr>
<tr>
<td>Staff Training</td>
<td>335</td>
<td>277</td>
<td>428</td>
</tr>
<tr>
<td></td>
<td>(32.2%)</td>
<td>(26.6%)</td>
<td>(41.2%)</td>
</tr>
<tr>
<td>Dealing with Consumer Complaints</td>
<td>244</td>
<td>291</td>
<td>505</td>
</tr>
<tr>
<td></td>
<td>(23.4%)</td>
<td>(28.0%)</td>
<td>(48.6%)</td>
</tr>
<tr>
<td>Cleaning/Disinfection</td>
<td>172</td>
<td>326</td>
<td>542</td>
</tr>
<tr>
<td></td>
<td>(16.6%)</td>
<td>(31.3%)</td>
<td>(52.1%)</td>
</tr>
<tr>
<td>Pest Prevention Programme</td>
<td>252</td>
<td>326</td>
<td>462</td>
</tr>
<tr>
<td></td>
<td>(24.3%)</td>
<td>(31.3%)</td>
<td>(44.4%)</td>
</tr>
</tbody>
</table>
Caterers

Some 70.1% of caterers considered HACCP to be "important" to the safe operation of their business (Table 10.6). Although higher than expected, this proportion was lower than any other factors. This suggests that caterers attach a lower importance to HACCP. This is supported by the fact that a higher proportion (6.7%) thought HACCP to be "unimportant" than did any of the other factors.

The importance of HACCP in preventing food poisoning was recognised by 63.4% who thought it to be either "important", "very important", or "essential". Only 7.3% thought it to be "not very important" or "not important". A significant proportion, 29.4% "did not know" (Question 15) (Figure 10.17).

Respondents at different levels within the company rated the importance of HACCP differently. A significantly greater proportion of catering managers and managers considered HACCP to be "important" than did other respondents (Q5 x Q22) (Table 10.11).

It was expected that there may be differences between establishment types. A significantly higher proportion of hospital/institutional and industrial caterers considered HACCP to be "important". This may be the result of more systemised food preparation in such establishments where there is a greater application of HACCP.
Figure 10.17 Caterers views on the importance of HACCP systems in preventing food poisoning from catering operations.

- 179 (21.6%) Very important
- 162 (19.6%) Essential
- 184 (22.2%) Important
- 72 (8.7%) No answer
- 46 (5.6%) Not very important
- 14 (1.7%) Not important
- 171 (20.7%) Don't know
Table 10.11 Scale of importance of HACCP in the safe operation of catering establishments as perceived by different levels of staff.

<table>
<thead>
<tr>
<th>Position within the Company</th>
<th>Very Important</th>
<th>Important</th>
<th>Not Important</th>
<th>Very Important</th>
<th>Irrelevant</th>
<th>No Answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>95</td>
<td>143</td>
<td>56</td>
<td>6</td>
<td>25</td>
<td>57</td>
<td>382</td>
</tr>
<tr>
<td>Manager/Manageress</td>
<td>76</td>
<td>82</td>
<td>19</td>
<td>0</td>
<td>6</td>
<td>20</td>
<td>203</td>
</tr>
<tr>
<td>Catering Manager</td>
<td>62</td>
<td>53</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>133</td>
</tr>
<tr>
<td>Hygiene/Safety Officer</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
<td>37</td>
<td>8</td>
<td>2</td>
<td>13</td>
<td>13</td>
<td>99</td>
</tr>
</tbody>
</table>
It was also considered that a higher proportion of businesses operating cook-chill and cook-freeze systems, in which a HACCP approach has been more widely adopted, would consider it to be important. This was not the case. Of caterers using cook-chill or cook-freeze, 78.2% thought HACCP to be "very important" or "important", compared to 71.9% of those operating cook-to-order or traditional catering.

Some 64% of all caterers indicated that they operated a "written" or "unwritten" HACCP system (Table 10.7). Although some 231 (27.9%) indicated that they had a "written" system this proportion was the lowest of any of the work systems listed in the questionnaire.

Caterers operating a HACCP system would be expected to keep written records. Those who indicated that they operated a HACCP system were, therefore, examined to see how many kept records of food temperatures, staff training, pest control, cleaning and disinfection. None of the caterers who indicated that they operated HACCP kept all of these records. This is of concern. It is important that good catering practices are in place before HACCP is applied. The absence of records and the limited proportion of caterers with written work systems indicates that this may not be the case.

These results suggest that respondents may have indicated that they operated HACCP because they felt that this was the answer expected. Given the emphasis being placed on HACCP as a food safety mechanism there is clearly a need for much greater awareness and understanding of the concept and its application within catering establishments.
Only 39.9% of caterers considered HACCP to be "practical" or "very practical". Nearly a quarter (22.8%) thought it either "not very practical", "difficult" or "very difficult" (Figure 10.18). Over a third (37.5%) were unable to answer the question. This indicates that there is a gap in perception which needs to be bridged if caterers are to be encouraged to adopt and operate a HACCP based approach. This suggests an urgent need for greater information and training in order to raise the awareness of HACCP.

Respondents who indicated that they operated a written HACCP system did not consider it to be any more or any less practical than those who did not. It was considered that those who operated such a system may have indicated HACCP to be easier to apply in practice than is generally perceived. Whilst this would have been encouraging, unfortunately this was not the case.

10.10 TRAINING

Retailers

Staff training in hygiene was considered "important" or "very important" to the safe operation of their business by some 84.8% of retailers (Question 5)(Table 10.4). However, the proportion where any formal qualification had been obtained by any member of staff was 44.9% (Question 12). Table 10.12 illustrates the proportion of retailers with formal qualifications in food safety.
Figure 10.18 Caterers views on the practicality of HACCP within their own catering operations.

- 234 (28.3%) Practical
- 133 (16.1%) Not very practical
- 41 (5.0%) Difficult
- 14 (1.7%) Very difficult
- 96 (11.6%) Very practical
- 90 (10.9%) No answer
- 220 (26.6%) Don't know
Table 10.12  Retailers Formal Qualifications in Food Safety

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Respondent</th>
<th>Staff</th>
<th>Respondent and Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree or equivalent</td>
<td>29 (2.8%)</td>
<td>5 (0.5%)</td>
<td>11 (1.1%)</td>
</tr>
<tr>
<td>RSH</td>
<td>15 (1.4%)</td>
<td>8 (0.8%)</td>
<td>14 (1.3%)</td>
</tr>
<tr>
<td>RIPHH Certificate</td>
<td>9 (0.92%)</td>
<td>9 (0.9%)</td>
<td>5 (0.5%)</td>
</tr>
<tr>
<td>RIPHH Diploma</td>
<td>6 (0.6%)</td>
<td>4 (0.4%)</td>
<td>7 (0.7%)</td>
</tr>
<tr>
<td>City and Guilds</td>
<td>38 (3.7%)</td>
<td>18 (1.7%)</td>
<td>17 (1.6%)</td>
</tr>
<tr>
<td>IEHO Basic FHgg Cert</td>
<td>108 (10.4%)</td>
<td>105 (10.1%)</td>
<td>194 (18.7%)</td>
</tr>
<tr>
<td>IEHO Int</td>
<td>22 (2.1%)</td>
<td>18 (1.7%)</td>
<td>9 (0.9%)</td>
</tr>
<tr>
<td>IEHO Adv</td>
<td>23 (2.2%)</td>
<td>7 (0.7%)</td>
<td>9 (0.9%)</td>
</tr>
</tbody>
</table>
Data were examined to determine whether respondents at different levels within the business assessed the importance of staff training differently. No significant differences were found.

Some 80 (7.7%) respondents had one or more higher level qualification, and of these 62.5% were owners of the business.

Only 29 (2.8%) had the Royal Society of Health and/or RIPHH qualification. The most common qualification amongst staff was the IEHO Basic Food Hygiene course, some 10.1% of retailers having staff with this qualification.

Figure 10.19 illustrates the types of in-house staff training provided by retailers. A significantly lower proportion had provided training in pest control (39.2%) and HACCP (20.5%) than in other subjects (Question 11).

The general level of in-house training was higher than expected. The effectiveness and quality of such training may vary considerably, and the level of training on pest control and HACCP is disappointing.

Respondents were asked to rank in priority, from 1 to 6, the cause of the greatest number of cases of food poisoning in England and Wales (1 indicating the highest number of cases caused and 6 the least). Recognition of both inadequate temperature control and cross-contamination as major causes (Ranking of 1 or 2) was used as an indicator of how effective training may have been. On this basis, a
Figure 10.19 In house training provided by retailers.
comparison was made between respondents having different qualifications. Only minor differences were found. The most significant was that 10.5% of those trained to the IEHO Basic Food Hygiene Certificate level recognised these two factors as major causes of outbreaks of food poisoning, whilst only 3% having a Degree or equivalent qualification did so.

Caterers

Some 93.6% thought staff training to be "important" or "very important" to the safe operation of their business (Question 5), however, 153 (18.5%) establishments had no members of staff with a formal qualification in food safety. Table 10.13 illustrates the qualifications of food handlers and the proportion trained.

The most common qualification amongst food handlers was the IEHO Basic Food Hygiene Course. Some 69% of all businesses had at least some staff trained to this level. In 44.1% of businesses over half the staff had attained this qualification.

Establishment types were examined for differences in the level of training. There were no significant differences except within the category "other establishment types" (predominantly public houses) where the proportion of food handlers with formal training was lower. The number of establishments where over 50% of employees were trained was too small from which to make valid statistical comparisons.
Table 10.13  Caterers formal qualifications in food safety

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Number of establishments where the Percentage of staff qualified</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td>Degree or equivalent</td>
<td>751</td>
</tr>
<tr>
<td>Royal Society of Health</td>
<td>750</td>
</tr>
<tr>
<td>RIPHH Certificate</td>
<td>770</td>
</tr>
<tr>
<td>RIPHH Diploma</td>
<td>776</td>
</tr>
<tr>
<td>City and Guilds</td>
<td>574</td>
</tr>
<tr>
<td>IEHO Basic Certificate</td>
<td>257</td>
</tr>
<tr>
<td>IEHO Intermediate Certificate</td>
<td>735</td>
</tr>
<tr>
<td>IEHO Advance Certificate</td>
<td>755</td>
</tr>
</tbody>
</table>
It was expected that a greater level of training within an establishment would result in a greater awareness of food safety. To identify whether this was the case, data from establishments where over 50% of the staff had obtained one or more formal qualification were grouped as "trained" and compared to those where there was no training who were grouped as "untrained". Some 15.2% of those "trained" identified a high potential risk, whereas only 5.9% of those "untrained" did so.

Within the "trained" group 56% considered inadequate temperature control and 63.2% cross-contamination to be "major" causes of food poisoning. Amongst establishments where the staff were "untrained" 41.1% placed temperature control and 42.4% cross-contamination as "major" causes. In establishments with trained staff there was a significantly higher appreciation of the causes of food-related illness.

In identifying what factors were important to the safe operation of their business, 97.2% of the "trained" group indicated that training was "very important" or "important" compared to 88.3% amongst those where staff were untrained. Of those who were trained, 78.3% thought HACCP to be "important" or "very important", whereas, only 53% of those without training thought this to be the case. The results show significant differences between establishments where there is little or no training and those where more than 50% of the staff handling open food were trained.

Not unsurprisingly, the overall level of formal food hygiene training was lower in the retail sector than in the catering sector. There was
little difference in the awareness of the causes of food related illness between retailers with training and those without. There was however, a significantly higher appreciation by caterers with training than without.

In this study, recognition of the causes of food related illness was used as an indicator of the likely benefit of training in improving food safety practices. Whilst this gives an indication of such benefits, it must be acknowledged that this presupposes that knowledge imparted in training is later translated into practical action. Whilst this is unlikely to be the case (WHO 1988) it is considered that without awareness of the causes a food poisoning a food handler is unlikely to be able to take appropriate steps to prevent it. The assumption used in the study is, therefore, considered to provide a valid indicator of likely benefit.

The study does not identify the influence that the general management within an establishments can have. For example in establishments where there is a good level of management awareness and control, there is also likely to be greater commitment to training and good practices. This may have a greater effect on the awareness of the causes of food poisoning and good practice than a formal training course.

In order to evaluate the effectiveness of training further a more detailed assessment is made in the study described in Chapter 11.
10.11 CROSS CONTAMINATION

Retailers

Some 47.5% of retailers considered cross-contamination to be a major cause of food poisoning. There was no significant difference between respondents at different levels within businesses or between establishments of different sizes.

To establish the potential for cross-contamination to occur in retail establishments, businesses undertaking one or more of the following activities were selected:

(a) Slicing cooked meats.
(b) Preparing sandwiches.
(c) Cutting hard or soft cheeses.
(d) Cooking any foods.

These businesses were considered to handle open food. Over half 58.3% (606) came within this category. This group were then examined to determine what proportion also carried out activities with the potential to permit cross-contamination with food poisoning organisms. Of the group, 192 (31.7%) cut raw meat, 176 (29%) sliced bacon, 294 (48.5%) weighed unwrapped vegetables, and 82 (13.5%) washed vegetables.

Businesses handling open food and in which one or more of these activities were also carried out were compared to other retail
establishments. No significant difference in the recognition of cross-contamination as a major cause of food poisoning was found.

This indicates that there is a potential for cross-contamination of ready to eat foods to occur in a significant proportion of retail establishments. Given that less than half of the respondents considered cross-contamination to be a major cause of food poisoning this a cause for concern.

Caterers

Some 56.3% ranked cross-contamination as a major cause of food poisoning (Table 10.2). This proportion was slightly higher than that which identified temperature control as a major cause (47.5%). No significant differences were found between establishment types or sizes.

A greater proportion of catering managers/manageresses (71.4%) recognised cross-contamination as a major cause of food poisoning than did other levels of respondents. As this category work at the practical level of catering operations this difference is likely to reflect greater current awareness and practical experience within caterers amongst this group.

Over half of all caterers (51.3%) indicated that they stored all raw and cooked/prepared food in separate units. Some 42.9% indicated that they stored some or all raw and cooked/prepared food in the same units. The level of caterers storing food in separate units was higher than
expected and was certainly greater than personal experience would suggest. Data were, therefore, examined to seek confirmation of these levels and to identify any variation.

Raw meat preparation and handling was carried out in an entirely separate area to cooked or prepared foods in 53% of catering establishments, raw vegetables in 50.7%, and raw eggs in 41.1%.

A higher proportion of company owners and managers/manageresses indicated that all or most raw and cooked/prepared food was stored in separate units than did other positions within the company although this proportion was not significantly higher.

Although the number of mobile catering vehicles from which a response was received was small (8), five of these indicated that they stored most or all of their raw and cooked/prepared food in separate units. Given the nature, limited space and facilities of most mobile catering units, it seems unlikely that this proportion would have the facilities to enable them to do this. This is also confirmed by the fact that six out of eight mobile units indicated that they handled/prepared raw meats, raw vegetables and raw eggs in separate areas. This implies, that the answers given to questions relating to the handling/preparation of foods in separate areas, and the provision of separate refrigerated storage facilities may not be representative of what happens in practice.
10.12 OTHER HYGIENE FACTORS

Retailers

A slightly greater proportion of retailers (96.3%) considered personal hygiene to be important to the safe operation of their business, compared to those who considered temperature control to be important (94.4%) (Table 10.4). This is interesting because only 26.6% thought inadequate personal hygiene to be a "major" cause of food poisoning. Whilst retailers clearly perceive personal hygiene to be important, these results suggest that this is primarily for aesthetic and business reasons rather than food safety considerations. Certainly, they did not respond as if they appreciated a connection between the two.

A high proportion (91.5%) also thought that pest control was important to the safe operation of their business, however, far fewer (31.3%) had a written work system (Table 10.10) and only 21.5% considered pest infestation to be a major cause of food poisoning (Table 10.1).

A significantly smaller proportion, 73.6%, thought the structure of their premises to be important to the safe operation of their business. It was expected that a greater proportion of retailers selling high risk foods might consider it to be important, however, no significant difference was found.

A high proportion (93.7%) felt stock rotation to be important and 86% claimed to have a work system, although only in 24.3% was this a written
system (Table 10.10). It was expected that a greater proportion of "large" retailers may have a written system. Data were, therefore, examined to determine any differences between types of establishment but no significant difference was found.

Some 93.9% felt that personal washing facilities were important to the safe operation of their business. It was expected that a greater proportion of retailers selling "high risk" foods may have rated washing facilities as "important" but no significant difference was found. Overall, 83.4% had a system for cleaning and disinfection and in 31.3% this was a written system (Table 10.10). However, only 25.3% felt inadequate cleaning and disinfection to be major cause of food poisoning (Table 10.1).

A greater proportion felt that quality assurance was "important" (90.6%) than those who considered HACCP (57.7%) to be important. However, only 28% had a written system to deal with consumer complaints (Table 10.10).

Caterers

More caterers (97.1%) considered that personal hygiene was important to the safe operation of their business than they did temperature control (95.8%) (Table 10.6). However, only 19.8% thought inadequate personal hygiene to be a major cause of food poisoning (Table 10.2).

As in the case of the retail sector, caterers clearly considered personal hygiene as important. However, the results again suggest that
this was primarily for aesthetic and business reasons rather than in the interests of food safety.

A high proportion of caterers (92.8%) thought pest control to be important, however, only 45.2% had a written system for pest prevention and only 12.6% considered pest infestation to be major cause of food poisoning. A significantly lower proportion (77.5%) considered the structure of the premises to be important. This is surprising given that effective pest proofing depends heavily on the structure and integrity of a building. Indeed, structure can have an important influence on activities within the premises, in preventing cross-contamination and in achieving high standards of cleaning. Such paradoxical data indicates a need for training in order that the connections between related issues might be confirmed.

Some 92.5% felt stock rotation to be important although only 28.5% had a written system. It was expected that a greater proportion of large caterers may have had a written work system. Data were, therefore, examined to determine any differences between types of establishment but no significant differences were found.

A high proportion (94.7%) felt that personal washing facilities were important although only 45.2% had a written system and only 15.8% thought that inadequate hygiene and disinfection was a major cause of food poisoning.
Significantly more caterers (92.5%) considered quality assurance to be important than did HACCP (70.1%). However, only 36.8% had a written system to deal with consumer complaints. Quality assurance has received extensive publicity in trade journals and it is likely that caterers would be familiar with the term (Crew 1991) (Spriegel 1993). This may in part account for the importance attached to this factor. If, however, the absence of a written system to deal with consumer complaints is used as an indicator of quality assurance being applied in practice then these results indicate that such implementation is limited.

These results present a somewhat confusing picture because the main question involved did not force the respondent to prioritise the importance of these factors. As a result, respondents indicated that they considered all factors to be important to their business. There were, however, two significant exceptions. Firstly, a significantly lower proportion of retailers and caterers considered the structure of their premises to be important and secondly, both sectors considered HACCP to be the least important of all of the factors.

The results could indicate a lack of awareness of HACCP. Since, however, the response to the same question indicated a good awareness of quality assurance this may imply that there is a lack of belief in, or understanding of, or commitment to the HACCP approach. This could have serious implications for the success of the HACCP based requirement in new hygiene regulations.
It is unclear why retailers and caterers considered the structure of their premises to be less important, however, they may have been unclear as to precisely what the term "structure" included. Further, considerable publicity has been given to instances where structural matters have been given disproportionate importance by inspectors and this may have influenced respondents in their answer. The structure of premises is one of a number of factors that can affect food safety. Whilst it is not necessarily the most important, it can have a very significant influence upon the morale of the staff, the way in which activities are carried out, in the prevention of cross-contamination and pest infestation and in the cleanliness of the premises. These results indicate that retailers and caterers may be underestimating the important role that good structure can have on the safe operation of food businesses.

10.13 CONCLUSIONS

There was a poor appreciation amongst retailers and caterers of both the causes of food poisoning and the potential risks associated with their businesses.

Less than a third of retailers and only 39.8% of caterers recognised both temperature control and cross-contamination as major causes of food poisoning.

Only a small proportion, 8.3% of retailers and 11.5% of caterers, considered the potential risk from their business to be high. Indeed,
the majority of retailers (75.3%) and caterers (70.3%) thought the potential risk to be low.

Less than a quarter of retailers (23%) and less than half of caterers (40.3%) thought the Act to have had a "considerable" or "major" impact on their business. This impact was considered greater by large rather than small establishments and was perceived as greater by managers than by proprietors. This suggests that the Act has had a greater effect on working systems than it has in terms of financial expenditure.

A high proportion of both retailers and caterers considered temperature control to be important to the safe operation of their business, but only 42.5% of retailers and 57.9% of caterers had an electronic thermometer to measure food temperatures. Given the poor level of recognition of temperature control as a cause of food poisoning, there is, therefore, cause for concern.

High proportions of both retailers and caterers considered pest control, personal hygiene, washing facilities, stock rotation and quality assurance to be important to the safe operation of their business. The proportions who implemented written work systems to deal with these issues were significantly lower and it appears unlikely that these views are being translated into practical action in food businesses.

Compared to other factors, a much lower proportion of retailers and caterers considered the structure of their premises to be important.
Whilst structure should not become an over-riding factor, it remains an important influence on the safe operation of a food business. These results suggest that there is a need to raise awareness amongst retailers and caterers of the role that good premises structure has in relation to food safety.

The enforcement powers introduced by the Act were perceived as effective. A significant proportion of both retailers (73.2%) and caterers (84%) considered Improvement Notices (INs) to be effective in making them carry out any necessary works. Over half of the retailers (55.7%) also thought that INs were effective in helping to prevent food poisoning. This view conflicts with the revised guidance issued by the Government on the use of INs which directs LAs towards more informal means of enforcement.

A clear majority of retailers (53.7%) are in favour of a licensing system for food premises as a means of helping to prevent food poisoning. This finding does not support the Government view that businesses are against such a system because of the cost involved.

In both retail and catering establishments the level of formal staff training is low. The most popular course is the CIEH Basic Food Hygiene Course. In establishments where over 50% of the staff had formal training there was increased appreciation of the major causes of food poisoning. It is unclear from the study whether this is the result of the training itself or whether it is a reflection of the
culture within the businesses concerned. Businesses with a strong commitment to training are also more likely to have a strong commitment to implementation of the work systems and standards.

Both retailers and caterers considered HACCP to be less important to the safe operation of their business than a range of other factors. Managers considered HACCP to be more important than did proprietors. Only 39.9% of caterers thought it "practical" or "very practical" to operate HACCP in their businesses, and over a third (37.5%) were unable to answer. These findings suggest that there is a lack of awareness of HACCP and a lack of commitment to its implementation. This could have serious implications for the success of the HACCP based approach in new hygiene regulations (HMSO 1995) and the Government's Assured Safe Catering scheme (HMSO 1993').

10.14 REFERENCES


289


11.1 INTRODUCTION

The study described in Chapters 9 and 10 revealed a high proportion of retailers (84.8%) and caterers (93.6%) who thought that staff training was important to the safe operation of their business.

The need for training and re-training of managers, food handlers, inspectors, and everyone involved in the food chain was a factor considered by the Committee on the Microbiological Safety of Food (Richmond 1991). The Committee concluded, "it is hard to overstate the potential which appropriate education and training have to offer for the maintenance of food safety. If those involved in the food chain had a greater awareness of where the true risks lie and of the available safeguards we are confident that the current incidence of foodborne illness would be very substantially reduced". As a result, the Committee recommended to the Government "that regulations on the training of food handlers be introduced in accordance with the framework outlined in the Committee's letter of the 28 June 1990, in response to the Department of Health's Consultation Document".

The European Community Council Directive on the Hygiene of Foodstuffs (EEC 43/93) subsequently introduced a requirement for the training of food handlers, and this requirement has been enacted in England and
Wales in the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995). These regulations, which are due to come into force in September 1995, require the proprietor of a food business to ensure that "food handlers engaged in the food business are supervised and instructed and/or trained in food hygiene matters to a level commensurate with their work activity".

Although no specific qualifications or courses have been designated as meeting the necessary level of training there are a number of food hygiene courses available. The extent to which each of these qualifications had been attained by food handlers within the retail and catering sector was examined within the study detailed in Chapters 9 and 10. The overall level of training was found to be low.

The draft catering industry guide (JHIC 1995) proposes three grades of hygiene training to meet the legal requirement. These are "the essentials of food hygiene", "hygiene awareness instruction" and "formal food hygiene training". Five categories of staff (A-E) are then identified, the level of training recommended dependent on the category. Within the formal food hygiene training grade are three levels of training. Level 1 involves a course of 6 hours duration, level 2 between 12 and 24 hours, and level 3 between 24 and 40 hours. The IEHO (now CIEH) food hygiene courses are listed as recognised courses.

There is considerable debate over the cost-effectiveness of training as a contributor to food safety. In particular, the type and level of training and the proportion of staff that require it. Arguably, the
strict application of HACCP may achieve a higher level of safety without the need for widespread formal food safety training amongst food handlers. Provided sufficient control was exercised in order to ensure that the system was applied in practice, training could largely be restricted to staff responsible for the design and implementation of the HACCP system. In theory, therefore, strict adherence to HACCP could reduce or eliminate the need for extensive food safety training amongst food handlers.

Against this background it was considered important to examine how effective training was likely to be in preventing food related illness.

Results from the study described in Chapters 9 and 10 indicated that the most common qualification amongst retailers and caterers was the IEHO Basic Food Hygiene Certificate. Since other comparable training courses such as those leading to the RSH Certificate and the RIPHH Certificate are essentially similar in content and subject area it was considered that food handlers attending this training course provided a suitable group for study.

This study examines the effect of the IEHO Basic Food Hygiene Course on candidates awareness of the main causes of food related illness. On the basis that improved awareness may lead to improved practices, the level of awareness is used as an indicator of whether the training is likely to help prevent food related illness.
The course is theoretical and of a six hour minimum duration. It has a multiple choice type examination paper at the end which requires a minimum of 20 out of a maximum of 30 marks for a pass to be achieved.

The course is widely provided nationally and in Guildford Borough is run by the Council on a monthly basis and less frequently by the local College of Technology. Students attending a course at these centres were asked to complete a questionnaire as part of the study.

The objectives of the study were to:

(a) Examine the effects of the IEHO Basic Food Hygiene Course Training on the appreciation by food handlers of the major factors implicated in outbreaks of food poisoning.

(b) Examine what effect the course would have on the work of food handlers and what changes they would make as a result of it.

(c) Identify reasons for food handlers attending the course.

(d) Identify the position of employees attending the course.
11.2 METHODOLOGY

Questionnaire Design

The same questionnaire design considerations as have been described in Chapter 9 were applied in the design of the questionnaire used in this study.

One of the main objectives of food safety training is to help prevent food related illness. Richmond (1991) concluded that "Whilst training is only one of many factors contributing to food safety and one cannot rely on education and training alone to provide all that is needed, one of the most important elements in effective food safety is awareness of the potential risks and the precautions that can be taken".

It was considered, therefore, that awareness of the major causes of food poisoning formed a valid indicator of the likelihood of training being successful in improving food safety. This indicator was also used as the rationale for comparison between retailers and caterers within the study described in Chapters 9 and 10. The same question as was used in that study was incorporated into this questionnaire. This required respondents to rank in priority from 1-6 a number of factors which they felt caused the greatest number of cases of food poisoning. This provided the potential for comparison of data between studies.

To identify the type and size of establishment in which the respondent worked and the number of meals prepared each day in that establishment,
identical questions to those used in the previous study were used within the questionnaire.

In order to examine differences before and after training, the questionnaire was designed in two parts. Part "A" was designed to be completed by the respondent prior to undergoing the course. This consisted of three questions. Two identified the type of establishment, a third required the respondent to prioritise the major causes of food poisoning. It was considered that students should be asked to complete the questionnaire without being told that there would be a second part at the end of the course. The questionnaire was then collected prior to the course being taught.

Part "B" was designed to be completed at the end of the course. Respondents were again asked to rank in priority from 1-6 a number of factors causing the greatest number of cases of food poisoning in the UK. This enabled a before and after comparison.

It was also considered important to establish why the respondent had attended the training course and how useful they felt that the content of the course would be to them. Questions to provide this information were, therefore, included.

Students were also asked what effect the course would have on the way they worked. To establish this a question was included which required students to indicate the effect on a four point scale ranging from "no change" to "a lot of change".

297
Whilst all of the questions were constructed in a simple tick answer format it was considered important that respondents should be allowed to give a short freehand answer to indicate the ways in which they felt the course would change the way they worked. For this reason, a simple question asking respondents to state three ways in which the way they worked would change was incorporated within Part "B". A draft questionnaire containing 8 questions was thereby produced.

Consultation and Discussion

The draft questionnaire was given to four Environmental Health Officer colleagues and 3 lecturing staff from catering colleges who were asked to comment on the format and the clarity of the questions and whether the answers available were adequate. Subsequently, some minor amendments were made to the wording of the questions, however, no major ambiguities or difficulties were identified.

The questionnaire used within the study is illustrated in Appendix C.

Distribution

Questionnaires were given to food handlers attending the IEHO Basic Food Hygiene course run by Guildford Borough Council and Guildford College of Technology between January 1993 and October 1993. Part A of the questionnaire was given to food handlers prior to undergoing the training course, and Part B given to them at the end of the course prior to them taking their examination. Continuity of parts "A" and "B" for
each student was maintained by an identifying code on the rear of the questionnaire.

Some 20 food handlers attending the course had difficulty reading or writing and where this was identified the questionnaire and possible answers were read out to the student and the answer selected was marked on the questionnaire for them. It is not uncommon among food handlers attending such courses to find some that have difficulty reading or writing and similar arrangements are often made to allow them to sit the examination by means of an oral examination.

Collation of Data

As questionnaires were completed, the data was entered onto a database created on Epi-Info 5 software (Dean et al 1990). Within the software system it is possible to define valid field entries for each question and this function was used in order to help assure the accuracy of data entry. This system was found to be very effective in preventing incorrect data from being entered onto the database.

The statistics facility within the analysis module of the package was then used to analyse the data obtained and the results of the study are detailed and discussed in Section 11.3.
11.3 RESULTS AND DISCUSSION

Statistical differences were established using Z-values and where significant differences are reported all are quoted at the 5% level (p=0.05).

General considerations

The study was undertaken amongst students at only two venues both of which are in the same Borough. There was, therefore, geographical bias within the study. Guildford is a relatively "affluent" area of the Country and compared to the national average has a higher proportion of the population is Social Class 1, 2 and 3M (HMSO 1993). It might, therefore, be expected that the general level of awareness of food safety issues within the population would be higher. In some aspects of food safety this has been established as being the case (FDF /IEHO 1994). For example the South East of England had the highest proportion of the population (75%) who always store perishable foods at home within 2 hours of purchase and who always used a coolbag for transporting chilled and frozen foods from shops on other occasions (13%).

The study could, therefore, have been improved by being undertaken over a wider geographical area within England and Wales.

Findings may also reflect the standard of teaching and the emphasis placed on particular topics by the lecturers. This could vary between areas and lecturers.
Lecturers were asked not to alter the emphasis they placed on topics in the light of the questionnaires but there may nevertheless have been a subconscious effect.

All of these factors may have influenced the outcome of the study.

Questionnaire return

A total of 235 questionnaires were returned. Of these 215 were completed by food handlers involved in the catering sector, the remaining 20 from the retail sector (Figure 11.1).

The number of retailers who attended the course was smaller than the minimum defined in the methodology for statistical analysis and, therefore, only the results for food handlers employed in catering establishments are discussed. The sample size was comparatively small given that employment in the consumer catering industry alone was over one million in 1992 (Euromonitor 1993). Nevertheless, it was considered adequate to allow some statistical conclusions to be made.

Type and size of establishments in which respondents were employed.

Of the food handlers from the catering sector, 41.2% were employed in hospital/institutional catering establishments, and 29.4% in public houses providing catering facilities (Figure 11.1). Most (41.2%) worked in establishments where 20 to 100 meals per day were prepared, however,
Figure 11.1 Types of establishments within which candidates worked.
nearly a quarter (23.5%) worked in establishments where less than 20
meals per day were prepared (Figure 11.2).

Causes of food poisoning.

The question used on this subject in the survey described in Chapters 9
and 10 was also used in this questionnaire (Questions 3 and 4). Respondents were asked to rank in priority from 1 to 6 the cause of the
greatest number of cases of food poisoning in England and Wales (1 indicating the highest number of cases caused and 6 the least).

Whilst a variety of factors may be implicated in cases of food
poisoning, previous studies have identified common factors contributing
to outbreaks. Inadequate temperature control and cross-contamination
are major contributing factors (Roberts 1982) (Bryan 1988). Improved
recognition of these two factors was, therefore, used as an indicator of
the effectiveness of training. This rationale was also used as a basis
for comparison within the study of retailers and caterers described in
Chapters 9 and 10.

For the purposes of this study, respondents giving a rating of 1 or 2
for a factor were considered to recognise it as a "major" cause of food
poisoning (Question 13). Using this criterion, the perceived
importance of causes before and after training were compared. These
proportions were then contrasted to the real causes of outbreaks
identified in previous studies.
Figure 11.2 The number of meals prepared per day by catering establishments in which candidates employed.

51 (23.7%) Less than 20 meals

89 (41.4%) 20-100 meals

38 (17.7%) 101-500 meals

25 (11.6%) More than 1000 meals

12 (5.6%) 501-1000 meals
In using such a basis for comparison it is acknowledged that the causes reported in previous studies relate to outbreaks of food poisoning rather than sporadic cases. This factor was identified in Chapters 6 and 7. Further, the comparison is based on the assumption that if food handlers are aware of the causes of food poisoning they are more likely to implement practices which avoid such causes.

Candidates rating of the importance of factors as causes of food poisoning before and after training are illustrated in Tables 11.1 and 11.2.

Following the training course, the proportion of candidates who indicated inadequate temperature control and pest infestation to be major causes of food poisoning decreased.

Inadequate temperature control has been implicated as a factor in up to 60.6% of outbreaks of food poisoning in England and Wales (Roberts 1982) and in up to 44% of outbreaks in the US (Bryan 1988). It is the most common factor associated with outbreaks and it is, therefore, essential that training should raise awareness of this as a major cause.

Before undergoing training, 40.9% of respondents indicated inadequate temperature control to be a major cause (Table 11.1). After training this proportion reduced significantly to 24.2%.
Table 11.1 Candidates Perception of the Importance of Factors as Causes of Food Poisoning prior to training.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Inadequate Temperature Control</td>
<td>50</td>
</tr>
<tr>
<td>Inadequate Hygiene training</td>
<td>38</td>
</tr>
<tr>
<td>Cross-Contamination</td>
<td>13</td>
</tr>
<tr>
<td>Poor or inadequate Personal Hygiene</td>
<td>50</td>
</tr>
<tr>
<td>Inadequate Cleaning/Disinfection</td>
<td>50</td>
</tr>
<tr>
<td>Pest Infestation</td>
<td>14</td>
</tr>
</tbody>
</table>

KEY: 1 = Highest number of cases caused
6 = Lowest number of cases caused

Number in sample = 215
Table 11.2  Candidates Perception of the Importance of Factors as Causes of Food Poisoning after Training.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Level of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Inadequate Temperature Control</td>
<td>37</td>
</tr>
<tr>
<td>Inadequate Hygiene training</td>
<td>63</td>
</tr>
<tr>
<td>Cross-Contamination</td>
<td>38</td>
</tr>
<tr>
<td>Poor or inadequate Personal Hygiene</td>
<td>13</td>
</tr>
<tr>
<td>Inadequate Cleaning/Disinfection</td>
<td>51</td>
</tr>
<tr>
<td>Pest Infestation</td>
<td>13</td>
</tr>
</tbody>
</table>

KEY: 1 = Highest number of cases caused  
6 = Lowest number of cases caused
These proportions are both significantly lower than the 51.9% of caterers in England and Wales who thought inadequate temperature control to be a major cause (Chapters 9 and 10).

The proportion recognising poor temperature control as a major cause after training is extremely disappointing. If this reduction in awareness was repeated on a national basis it would indicate a very serious shortcoming in training.

Since the importance of temperature control is stressed repeatedly throughout the course textbook (IEHO 1992) and is a recurring subject for questions in the examination it was expected that the awareness would have increased.

The reduced recognition of the importance of temperature control could be the result of:

(a) A lack of emphasis during the course.
(b) The method or style of teaching.
(c) The presentation of course material.
(d) Overemphasis of other factors during the course.
(e) Over provision of information to students who may, therefore, confuse important and less important issues.

These factors may have been compensated for if the study been undertaken at a larger number of centres where a wider variety of lecturers had been involved. However, over 50 candidates undertook the training at
each of the two venues and statistical analysis did not show a
significant difference between them even though different lecturers were
involved at each.

The proportion of candidates who considered pest infestation to be a
major cause fell from 24.2% before the course to only 14.4% after it.
The proportion after training was similar to that found in the survey of
caterers in England and Wales, where 12.6% thought it to be a major
cause.

Following the training course the proportion of candidates who indicated
other factors to be major causes of food poisoning increased.

Cross-contamination is a major cause implicated in outbreaks of food
poisoning. It was, therefore, considered that training should improve
awareness of it. In this respect the training was successful. The
proportion who considered it a major cause increased from 35.3% before
training to 42.8% afterwards. However, even after training, the
proportion was significantly lower than the 56.3% found amongst caterers
in England and Wales (Chapters 9 and 10).

Whilst a 7.5% increase in awareness is encouraging, however, it is
considered that effective training would be more successful in
increasing this proportion and that the overall level of awareness
should be considerably higher than the 42.8% found.
Training increased the proportion of candidates who thought poor or inadequate personal hygiene to be a major cause from 34.8% before to 41.4% afterwards. Both proportions are significantly higher than that found amongst caterers in England and Wales (19.8%).

Poor or inadequate personal hygiene is very important to food safety particularly where open food is being prepared or handled. In the case of infected food handlers the standard of personal hygiene could be the critical factor in determining whether infection is passed on via food. In this respect, training was again successful in increasing the proportion who considered it to be a major factor.

The proportion who considered inadequate cleaning and disinfection to be a major cause increased from 29.3% before training to 35.8% afterwards. Whilst cleaning and disinfection is important to food safety, it has not been implicated as a major contributing factor in outbreaks of food poisoning. The proportions before and after training were significantly higher than the 15.8% found amongst caterers in England and Wales.

Although it is desirable that training should reinforce the importance of cleaning and disinfection, in terms of risk it was considered that inadequate temperature control and cross-contamination were the more important factors. Whilst training increased awareness of cleaning and disinfection from 29.3% to 35.8%, the benefit of this is likely to be offset by the reduced proportion who thought inadequate temperature control to be a major factor.
Training was effective in improving recognition of cross-contamination as a cause of food related illness. Recognition of inadequate temperature control, by far the most common contributing factor described in the literature, significantly reduced after training.

The proportion of food handlers who recognised both temperature control and cross-contamination to be major causes was significantly lower after the course (12.5%) than before it (25%).

If improved awareness of inadequate temperature control and cross-contamination is used as an indicator of the effectiveness of training, this study indicates that it was only partly effective. The criteria set out by Richmond (1991) as a basis for improving food safety were only partly met. There are, therefore, serious doubts as to whether the content and/or method of teaching is likely to be effective in improving food safety.

There is, however, a different interpretation that can be drawn from these results. Although recognition of inadequate temperature control and pest infestation decreased, recognition of all the other food safety factors increased. Clearly these would contribute to an improvement in food safety.

More importantly, the proportion who thought inadequate training to be a major factor significantly increased. Some 35.3% felt it to be a major cause before the course whilst this increased to 41.4% afterwards. Both proportions are higher than the 19.1% of caterers in England and
Wales (Chapters 9 and 10). This may indicate that the knowledge candidates had acquired during the course led them to the conclusion that training was a very important factor in preventing food poisoning because it would improve awareness of the major factors contributing to it.

To establish whether this was the case, candidates who indicated inadequate temperature control to be a major cause of food poisoning prior to training were selected. The response from these candidates was then examined in order to identify the factors they later considered to be major causes following the training course. Only 14.3% of this group later indicated training to be a major cause, whilst 7.2% changed to cross-contamination, 28% to inadequate personal hygiene, 26% to cleaning and disinfection and 16% to pest infestation.

This does not suggest that the fall in the proportion recognising inadequate temperature control as a major cause was the result of a greater recognition of the importance of hygiene training. Had this been the case, a higher proportion of those who identified inadequate temperature control as a major cause before the course would have been expected to switch to inadequate hygiene training.

Reasons for attending the course.

Most food handlers attended the course because they felt they needed to because of their job (41.2%). However, a quarter attended either for personal interest or because they were asked to by their employer
(Figure 11.3). Whilst it is encouraging that most food handlers attended because they considered they needed to due to their job, in all cases the fee was paid by their employer. This indicates that their employer was probably more instrumental in the decision that they had to attend.

How beneficial was the course?

There were no candidates who indicated that the course would be of "no" benefit to them (Figure 11.4). It is possible that they may have been reluctant to appear critical of the course or lecturers, however, most (50%) felt that it would be "useful" to them and some 37% felt that it would be "very useful". This is extremely encouraging, however, to be of benefit it is essential that the course is able to raise awareness of the true risk factors involved in food poisoning.

Given the somewhat conflicting evidence on the effectiveness of the training in raising awareness of the major causes of food poisoning students may have indicated their interest in the course rather than the real benefit from it.

This conclusion is supported by examination of the candidates response to the question which investigated the effect what they had learnt would have on the way they worked (Figure 11.5). Some 25% felt it would result in "little" or "no" change. Most (75%) felt it would result in "some" change, however, none of the food handlers felt that the course would result in a "lot" of change on the way they worked.
Figure 11.3 Candidates reasons for attending the course.

88 (40.9%) Asked by employer
51 (23.7%) Personal interest
76 (35.3%) Need to because of job
Figure 11.4 Candidates views on the benefit of the course.

- 152 (70.7%) Very useful
- 51 (23.7%) Useful
- 12 (5.6%) Some use
Figure 11.5: Candidates views on the likely effect of the course on the way they worked
It is doubtful, given candidates own assessment, whether significant changes in work methods would occur in practice. If such changes did occur, their effectiveness in preventing food poisoning would depend on whether they removed the risk factors contributing to it. Given that the recognition of inadequate temperature control reduced after the course, it is questionable whether any change that did take place would be effective in preventing food poisoning.

What changes in work practice will result?

This question was the only one which required a "freehand" answer and a surprising 17.6% of candidates were unable to identify any changes that they would make as result of attending the course. It is not clear whether this was because they had not benefited from the course and would not be making any changes or whether they were unable or did not wish to complete this part of the questionnaire.

It was anticipated that a large variety of answers may be given and that it might prove difficult to examine these. In practice only nine different changes were identified by food handlers and the proportions that indicated they would be making these are illustrated in Figure 11.6.

The change indicated by the largest proportion of food handlers was that they would undertake more checks on refrigerator temperatures. Some 41.2% identified this as a change they would make.
If this proportion undertook these checks in practice then this suggests that the course was successful in identifying this key area for attention and it may, therefore, make an important contribution to food safety. This response conflicts with earlier findings about the recognition of inadequate temperature control as a major cause of food related illness. It is possible, however, that awareness of temperature monitoring may have been raised without necessarily the reason being understood. It is also possible that the level of temperature monitoring in the establishments in which the food handlers worked was poor although results from the study described in Chapters 9 and 10 indicate this not to be the case.

Some 29.4% felt that they would apply a greater general awareness of food safety to their everyday work. Although non-specific this is encouraging in that it suggests a perceived positive benefit from the course. This must, however, be treated with some caution since key factors need to addressed by the course if it is to be effective in improving food safety.

Less encouraging was the low level of candidates who indicated that they would make changes in their work to prevent cross-contamination. Only 5.9% said that they would do so. This is a very low proportion, however, it may be that candidates considered that they already took sufficient precautions to prevent cross-contamination from occurring. As a result, they may not have identified this as a change they would make. Since it is very unlikely that at least some change in work practice would not be required, this may indicate a failure to educate
them to the dangers. This conflicts with the earlier finding which identified a 7.5% increase in the awareness of cross-contamination as a major cause of food related illness.

A variety of answers were given in response to the question however in most cases the changes identified were unlikely to be significant in reducing the incidence of food poisoning. For example, whilst the air drying of dishes and the increased use of clean overalls are good practices which are to be encouraged, they are not major factors commonly involved in outbreaks of food poisoning.

It is possible that the results reflect how well caterers were operating and, therefore, there was little scope for improvement. This is clearly unlikely and is not supported by findings of previous studies (Audit Commission 1990).

None of the food handlers identified a HACCP approach or the training of other staff as being a change that they would make. The subject of HACCP is only briefly discussed within the course, however, it will become a legal requirement from 1995 and is intended to play an important role in food safety. Although the course is primarily aimed at basic food handlers and not management level employees a number of proprietors, supervisors and managers were known to have attended these courses. It was expected, therefore, that there would have been some reference to HACCP and risk management.
11.4 CONCLUSIONS

The findings of the earlier study described in Chapters 9 and 10 indicated that both retailers and caterers considered training to be important to the safe operation of their business. The study also showed the IEHO Basic Food Hygiene Course to be the most popular amongst caterers. The new regulatory requirement for the training of food handlers (HMSO 1995) is a major element in the Government's food safety policy and the IEHO Basic Food Hygiene course is listed as an example of a formal training course in the draft Catering Industry Guide (JHIC 1995).

This small scale study has, therefore, examined the effectiveness of the IEHO Basic Food Hygiene training course in improving awareness of the principal causes of outbreaks of food poisoning.

Although it is acknowledged that the study has relatively low population, the results provide some indication of how successful the regulatory requirement for training is likely to be.

In interpreting the results of this study, a number of influencing factors must be considered. These are:-

(a) Whilst the knowledge of the candidates immediately before and after the training has been examined, the study did not evaluate whether this resulted in changed working practices in an operational situation.
(b) Although some 15% of food handlers who attended the course were employed in businesses outside the Borough the study was limited to courses being run within Guildford Borough. As a result there may be geographical bias in terms of the catering population, the course content and the quality of lectures.

(c) The number of candidates attending the course was small in comparison to the 221,757 candidates taking the IEHO Basic Food Hygiene Course in 1993 (CIEH 1994). Whilst this factor must be considered, the results provide a useful baseline of information from which conclusions can be made and which can be used to identify areas requiring further investigation.

(d) It is often assumed erroneously that during training there is a straight transfer of knowledge from an expert to a food handler and that this knowledge is then translated into correct behaviour in practice. Experiences in health education throughout the world prove that this is invariably not the case (WHO 1988). The course resulted in an apparent reduced awareness of inadequate temperature control as a major cause of outbreaks of food poisoning. Whilst there was an increase in the awareness of cross-contamination, when both factors are considered jointly, there was an indicated overall reduction in the level of awareness.

Even if, therefore, candidates were to implement changes in their work practices as result of the course it is unlikely that these would
significantly increase prevention of outbreaks of food poisoning. Given that awareness of other factors except pest infestation increased, there would, however, be an expected improvement in food safety.

The results are somewhat contradictory and there is, therefore, an urgent need for a closer and more detailed examination of the content and effectiveness of training, particularly the emphasis that is placed on key areas within it. This is particularly important in order to ensure the success of the new training requirement and in order to ensure that food businesses are able to provide the most cost-effective training for their needs.

It is possible that by adopting more practical training, by shortening the course or concentrating more on important key areas such as temperature control and cross-contamination, that its success can be improved. Only if the training is able to change attitudes to food safety and these are translated into changed work practices in key safety areas is it likely to result in a significant improvement in food safety. This also requires a commitment from management, in order to create a culture which reinforces training messages and offers incentives which encourage new behaviour to be adopted. Indeed, Rennie (1995) considers that the provision of formal food hygiene training without a co-ordinated workplace reinforcement is unlikely to have a major effect on food hygiene standards.
11.5 REFERENCES


12.1 INTRODUCTION

The success of systematic approaches to hygiene management in food manufacturing establishments has led to suggestions that such a technique should be applied to the catering industry. This approach, was endorsed by the report of the Committee on the Microbiological Safety of Food (Richmond 1991). They recommended that the Government should take the lead in drawing up guidelines for the catering industry and that these should include advice on the identification of hazard points and control.

Although HACCP has primarily been applied in manufacturing situations, the general principles and controls can be applied to other sectors of the food industry. For example, cook-chill and cook-freeze production units have more readily adopted a HACCP type approach, since these systemised processes lend themselves to this. Traditional catering operations, in which a much wider range of foods are prepared, use a greater variety of techniques. The application of HACCP to each of these is more involved and, therefore, more onerous and costly in resources, particularly in small businesses. Indeed, the application of HACCP within the catering industry may have far reaching implications not just for hygiene, but also for the way in which the industry is structured (Sheppard 1990).
Nevertheless, EC Legislation (EEC 43/93) includes a requirement for food businesses to apply HACCP principles to their operation. From September 1995, this will become a legal requirement in the UK (HMSO 1995). Regulations will require the proprietor of a food business to identify any step in the activities of the food business which is critical to ensuring food safety and to ensure that adequate safety procedures are identified, implemented, maintained and reviewed.

The WHO recommend that academia should be encouraged to include HACCP in education curricula for professionals within food, science and technology and related health and food fields (WHO 1993). The report also acknowledges a number of training considerations for the application of HACCP in food processing. At least in part of the recognition of the need for guidance on this subject, the DOH have supported the promotion of the "assured safe catering" scheme for the catering industry (HMSO 1993).

The findings of the study, described in Chapters 9 and 10, indicated that amongst a variety of factors, both retailers and caterers considered HACCP to be the least important to the safe operation of their business. Some 22.8% of caterers thought HACCP to be not very practical, difficult or very difficult to apply within their businesses and a further 37.5% were unable to say how practical it would be.

Given this perception, the low overall application and level of awareness, and the concerns about the application of the technique within catering establishments, the success of the requirement for a
HACCP approach to be applied within all food establishments from September 1995 must be in question.

In the light of these factors, it was considered important to examine through case studies the extent to which HACCP principles were being applied within retail and catering establishments. Further, to determine how difficult its application had been or was likely to be in practice, to suggest how this new requirement will be received by the trade, and how successful it is likely to be.

The objectives of the case studies undertaken are to :-

(1) Describe the food safety procedures in retail and catering establishments of different sizes and types.

(2) Identify whether HACCP is currently being applied.

(3) Identify whether elements of a HACCP approach are being applied within an informal system.

(4) Identify shortcomings within such establishments.

(5) Identify the advantages/disadvantages of adopting HACCP type principles within such businesses.

(6) Identify the obstacles to implementing a HACCP type approach and suggest how the application of HACCP
will affect catering and retailing establishments.

(7) Identify areas of concern in the implementation of HACCP and suggest measures by which these could be overcome.

12.2 METHODOLOGY

Selection of premises for study

Two retail outlets and three catering outlets of varying size, which operated within the area of Guildford Borough Council, were selected as subjects for case studies.

Premises were selected to provide examples of different sized retail and catering establishments which would be representative of their particular group. Different sizes of establishment provided a basis for comparison of the relative suitability and difficulty of a HACCP type approach being implemented.

It was recognised that this would not represent a random sample, however, it would provide a useful basis for further examination of the application of HACCP in practice which would supplement the findings of the study in Chapters 9 and 10.
Audit schedule

Guidance to caterers on the application of the Hazard Analysis requirement has been detailed in the Government's "Assured Safe Catering" booklet (HMSO 1993). Within this guidance, a schedule of steps within catering operations and the hazards associated with these is set out. Based on this schedule an audit framework was devised for examination of the catering and retail operations being studied (Appendix D).

In each establishment either the proprietor or their representative were interviewed using this audit schedule. However, this framework was varied dependent on the nature of the operation. For example, steps such as cooking and reheating were not relevant in the case of retail operations.

This method is subject to possible error and bias, since factors such as dress, the age, sex and personality of the interviewer can influence the process of person to person interchange. However, evidence that people enjoy talking much more than completing questionnaires is one of the main advantages of the personal interview. Such an approach has been suggested as one of the most appropriate methods of collecting information (Belson 1988).
The personal interview was followed by an audit of the operation of the food business. Particular regard was had to the following stages of the operation:

1. The purchase of food items.
2. The receipt of food items.
3. The storage of food items.
4. The preparation/production of food.
5. The cooking and cooling of foods.
6. The storage of prepared food items prior to service.
7. The service of food items to customers.
8. The cleaning of the equipment and premises during and at the end of the working day.

Phillips (1981) stressed the importance of direct observation in studies of labour intensive operations, and it was intended that observation would be used to augment data from interviews with management. In each of the areas identified, the application of hygiene policy, as described by managers during the interview, was then studied with any departures from the policy in practice noted.
Observation of the activities within the business were kept as unobtrusive as possible in order to ensure that the behaviour of catering staff was influenced as little as possible. Periods of observation were kept as brief as possible and observations were recorded using a small hand held tape recorder rather than in writing. This was done in order to avoid the effect of such activity on the behaviour of catering staff.

Temperature checks to monitor food and refrigeration temperatures and to check the accuracy of any temperature monitoring devices used by retailers and caterers were carried out using a Kane-May Model Foodcheck electronic thermometer. Prior to the audit being undertaken the unit was calibrated using a Kane-May electronic calibration cap and by checking the unit and probes against a National Physical Laboratory standard thermometer using the method described in Code of Practice No.10 (HMSO 19913).

12.3 CASE STUDY 1 - CATERING AT A HOTEL/RESTAURANT UNIT PART OF A NATIONAL CHAIN

12.3.1 Unit profile

Number of Employees = 55

Food Handling Staff = 27 Full-time, including Waiters, Waitresses, Chefs, Kitchen Porters and Room Service Staff
Number of Meals prepared = 1300 per week

Type of Meals = Wide range of foods handled and prepared.

Type of food preparation = Cook to order, but significant cook-chill practices.

Person Interviewed = Company Hygiene and Safety Manager

12.3.2 Interview

No formal HACCP system had been applied by the company at any unit within the national chain. There were no plans for HACCP be formally introduced, as the Company policy was to expect standards to be closely monitored at all stages in order to prevent incidents from occurring.

The operating procedures within the unit had not been devised using the ASC approach. The Company had a group "food safety policy statement", underwritten by the Chief Executive, which set out the Executive responsibility. This was supplemented by a unit "food safety policy statement" for each operating unit within the Company. This detailed the responsibility of line management and staff within the organisation. Within each unit the General Manager assumed the responsibility for food safety.
Written arrangements were detailed for the following matters:

(a) Food delivery and storage.
(b) Temperature control.
(c) Food preparation.
(d) Food service.
(e) Food handler personal discipline and knowledge.
(f) Broken glass and foreign body policy.
(g) Cleaning routines and chemicals.
(h) Maintenance and pest control.

12.3.3 Audit of procedures in practice

Purchase

The Company operated a purchasing policy based on "supplier authorisation", whereby suppliers were authorised to supply specific products. The food safety manual instructed Unit Managers that they were not permitted to purchase locally from unauthorised suppliers.

In practise there was no evidence of this protocol being ignored, however, the staff responsible for receiving foodstuffs were not able to name the suppliers.

The work arrangements for delivery and storage assumed that the protocol was being observed and the system was, therefore, dependent entirely on
the manager ordering goods, the person receiving goods not able to check that the Company policy was being adhered to.

Receipt of Food

There was a documented system for food delivery, however, this system was basic, the instructions being general and non-specific. Staff observed and interviewed were not aware that the system was documented in the food safety policy. They were, however, generally aware of the requirements, which had been communicated to them during their induction training and later reinforced "on the job".

The policy required visual checks for date coding, temperature control, transit damage and general acceptability. It did not, however, give criteria for acceptance or rejection, other than the instruction "Do not accept food subject to abuse". The system was, therefore, dependent on the judgement of the person receiving the food. In practise, visual checks were carried out although the extent to which this was done varied with the person involved. Staff carried out temperature checks using a Therm 20 electronic thermometer unit and an attached chisel probe. This type of probe is not commonly used for between pack temperature measurements. The temperature checking was rather cursory. In all cases the top packs of the delivery were lifted and the probe placed below them. No check to identify areas where the temperature may be above that required was carried out.
The food handlers involved had received on-the-job training and instruction and all identified 5°C or below as an acceptable temperature. All were, however, unaware of possible inaccuracies in temperature measurement, the need for calibration of the thermometer, or whether the Company undertook any calibration. The Company's electronic thermometer was tested against the calibrated electronic thermometer unit and was found to read 2°C lower than the actual temperature.

Temperature records for food deliveries were completed and four months of records were examined. A remarkably consistent temperature profile was found, with a variation of only 1°C. The records did not indicate any checks where food had been above 5°C or where foodstuffs had been rejected. Although this could be the result of a well controlled delivery system, it must be regarded with some suspicion as it would be expected that a greater variation in temperature would occur, and that an occasional delivery would have been at or above the acceptable temperature limit.

All the foods observed were wrapped in cardboard containers to protect them from the risk of contamination. The food safety policy instructed that outer packaging be removed wherever possible, especially where it was in a wooden or cardboard container. This instruction was only partly followed and a number of food deliveries in cardboard boxes were placed directly into storage without this taking place. There was, therefore, the potential for contamination to be introduced to these areas and subsequently for cross-contamination to uncovered foods to
take place. Several such containers with dirt on their outer surfaces were observed within the refrigerated storage area.

Storage

The food safety policy contained a general storage instruction. This required that the time from food being delivered to it being placed into storage should be as short as possible. No time limit was specified. When questioned, staff were unclear about what time lag was acceptable. During the audit, deliveries were quickly placed into storage, however, the staff involved intimated that refrigerated foods would not normally be left in the delivery position for more than two hours. This implied, that on occasions, refrigerated foods were left under ambient storage conditions for up to two hours. Whilst this may meet minimal legal requirements, it indicates a break down in the maintenance of the cold chain and a potential failure of the control system.

Stock rotation in the main walk-in chiller stores was good, however, this became more haphazard when foods were moved into refrigerated units within the kitchen and other food areas. A number of food packs within the refrigeration units in the kitchen had no date coding on them and it was, therefore, impossible to tell whether stock rotation was being followed. The instruction within the food safety policy to date code was not being followed.

Temperatures for chilled and frozen food were specified and the frequency and method of checking temperatures in freezers and
refrigerators was documented within the food safety policy. Checks in these units were required at a minimum frequency of twice per day by means of either (a) thermometer dials fitted to the unit or (b) using a hand held thermometer.

All of the walk-in chillers and refrigeration units had thermometer dials fitted to them and these were being used to monitor temperatures. Temperature records indicated that checks were being carried out, however, a surprisingly consistent temperature was being maintained within the units. This must give some cause for suspicion, since the thermometers were recording air temperature and this would be expected to fall and rise regularly with the opening of the doors and during defrost cycles even if a damped temperature sensor was being used. In practice, the person undertaking the temperature checks signed the temperature record as being correct. There was no evidence of auditing taking place and the accuracy of the refrigerator temperature dials was checked using the calibrated electronic thermometer.

In the refrigeration cabinet the temperature dial indicated a temperature 3°C lower than that measured using the calibrated electronic thermometer.

The temperature records for chilled and frozen food storage were comprehensive and consistently completed. There were occasional gaps in the recording system where weekly summaries were missing. None of the temperature records indicated that any of the refrigerators had gone above temperature, although during discussions with the chef, it was
clear that there had recently been a problem with two of the refrigerators within the kitchen area. These had required major servicing in order to bring them back into use. This was not detailed within the temperature records.

Whilst a number of checks were being made and records kept, there was considerable doubt about the reliability of the temperature measurements, and whether controls would be applied in the event of a temperature failure.

Preparation

General guidance on preparation requirements was detailed in the food safety policy. This was general and required food-handlers to minimise the exposure of high risk foods to unrefrigerated conditions.

No time/temperature standards were set for the cooking procedures. These relied entirely upon the expertise of the chef. Whilst no evidence of shortcomings were observed, no time/temperature standards were prescribed and no checks were carried out. This critical control point was, therefore, left entirely to the discretion of the chef on duty. Interestingly, during the preliminary interview the Company Hygiene and Safety Officer indicated that the temperature of cooked foods was measured immediately they were removed from the oven in order to ensure that the core temperature had reached a minimum of 75°C. The chef was unaware of any such requirement and advised that this was not done.
A blast chiller was used for the rapid cooling of cooked meats, joints, and similar items. Although the method for cooling cooked foods was not defined within the safety policy, the observed practices were satisfactory. The chef considered this recently purchased unit to be the most important piece of equipment that had been purchased.

Hot Holding

The food safety policy required the temperature of hot holding units to be checked daily. Temperature records were available and indicated that temperature holding standards were being met. These showed a greater variation in temperature than had been found in chilled temperature records. Hot food temperatures varied from 72°C to 98.2°C. These temperatures were, however, all of soup or semi-liquid dishes and there were no temperature records for cooked joints of meat.

During the audit staff were asked to carry out a temperature check. This was undertaken using the same electronic thermometer as had been used for food deliveries. It took the staff some five minutes to find the thermometer as it was in the drawer of the Manager's office. No sterilising wipes were available, however, the chisel probe being used was washed with detergent and hot water. The probe was placed into a container of gravy within the bain-marie unit and the temperature recorded once the unit had stabilised. The food handler could not give any criteria used to select a particular food for checking.
The temperature check was made on one foodstuff only. The gravy had only recently been placed onto the servery and was, therefore, still hot and above the temperature of the unit. The temperature measured within the soup was 85°C. Checking of other food products within the display using the calibrated electronic thermometer showed a variation of food temperature from 62°C to 86°C. Whilst, therefore, the temperature of most foods complied with the minimum legal requirement, the temperatures being recorded in the records did not provide a reliable indication of general food temperatures within the unit.

No formalised system to control the length of time foods were retained at a hot holding temperature was being operated. This was left to the discretion of staff working in the servery area. Food left at the end of service was placed into the blast chiller, to provide rapid cooling, and was then re-heated for the next service of the day. At the end of the day, any food still remaining was again placed into the blast chiller and could only be consumed by staff the following day. Examination of the foodstuffs within the blast chiller showed that there was no system to identify foods which had previously been on display. It was difficult, therefore, to tell which had been subjected to previous heating and chilling.

Temperature Monitoring

The documented system within the food safety policy was sound, but limited in its extent and failed to detail specific requirements other
than a 5°C maxima for refrigerated high risk foods and a minimum of 63°C for hot cooked foods.

Protocols for temperature measurement were absent or badly defined.

Record keeping was good, but the consistency of the recorded temperatures gave cause for concern. This was an added indication that although procedures were being followed, the control system was failing and consistency was not being questioned or checked.

Thermometers inside walk-in chillers were found to provide a good correlation with temperatures of food within the unit, but the temperature dials on refrigeration units within the kitchen consistently gave readings below those measured with the calibrated electronic thermometer.

Auditing of the temperature monitoring system was poor, and there was no indication of any follow up action to check the validity of the records. Significantly, there was no evidence of any failures within the entire temperature control system. This gave the impression of being "too good to be true" picture. In practice this would not be expected.

Training

The Company required all staff joining the Company to be given a copy of the Company's arrangements for "food handler personal discipline and
"knowledge". In addition, all food handlers were required to take the RIPHH Certificate in basic food hygiene.

Training records were maintained in the "Food Safety Procedures and Record Book" held at each unit. Wherever possible, agency staff used to cover holidays or absence from work of full-time staff were required to have an equivalent level of qualification. However, in practice this proved difficult, and on occasions food handlers without this qualification were employed by the Company on a temporary basis. Although a copy of the record book for the unit was present, it was in a state of disarray, and the training records had clearly not been kept up-to-date.

It was difficult to check how quickly staff underwent training after starting work as the records that were available did not indicate the date on which staff commenced work, only the date on which they received their training. General discussion with food handling staff in the organisation indicated that training took place fairly quickly after they commenced work, usually within six weeks of starting.

12.3.4 Discussion

Although no formal HACCP system had been applied by the Company, some hazard analysis had been undertaken to control critical areas within the operation. These controls were detailed within a food safety policy. Three key areas, namely food supplies, temperature control, and training had been targeted within the policy.
Greater control of the quality and temperature of food supplied had been achieved by the authorisation of suppliers within the parent company group.

Temperature control was a prominent part of the food safety policy. In practice, however, the temperature control system had a number of weaknesses and failings. Temperature monitoring of the food products on receipt, during and subsequent to preparation was carried out using one electronic thermometer with a chisel probe. The location of the thermometer was not known by many of the staff involved. The thermometer was not calibrated against a standard. Indeed, it had not been calibrated by the Company since it had been supplied to the unit. Since most of the staff appeared to be unaware of the location where the thermometer was stored, it seemed unlikely that it was in frequent use, except by staff receiving food deliveries.

There were no time/temperature specifications for food during preparation or cooking, and the control of hot held cooked food at the servery was poor.

Although staff training was good, there was no evidence of any particular training in temperature measurement and the use of temperature monitoring equipment. Whilst, therefore, the temperature of food during delivery to the unit appeared to be well controlled, the system of temperature control within the unit appeared to be rudimentary and something of a paperwork exercise. More importantly, critical areas
such as time/temperature control of cooked and prepared foods was absent.

The system for the training of staff was good. Although training and refresher training records were rather patchy, discussions with individual staff indicated that training and refresher training was being carried out in accordance with the requirements of the food safety policy.

It was expected that this establishment, which was part of a major UK catering company, would have a well developed HACCP based system. Of the units audited, this unit together with that in case study 2 had the most developed food safety policy and control system. Given the professional and technical expertise and the financial wherewithal of a company of this size it was surprising that there was a need for considerable further development in order to achieve a level of "HACCP" which would satisfy the requirements of the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995).

12.4 CASE STUDY 2 - CATERING AT A LARGE HOSPITAL KITCHEN

12.4.1 Unit profile

Number of Employees - 72 Full time equivalent.

Food Handling Staff - 12 Per shift, two shifts per day. (One head chef, one assistant head chef, one chef, one
diet chef, six catering assistants, and two porters.)

Type of Meals  – Wide range of foods handled and prepared.

Type of food preparation – Cook to order, some cook chill for small quantities of food.

Person Interviewed – Catering Manageress.

12.4.2 Interview

A formal HACCP approach had not been applied within the Unit, however, a "food hygiene and food handling manual" had been produced. This formed a code of practice for the hygienic storage, production, cooking and service of food in catering departments and all health premises where food was handled within the area of the Health Authority.

Many hazards were identified and addressed. It was the intention that this base be built on, and for HACCP to be formally applied. The application of HACCP had been delayed, due to the catering function being subject to compulsory competitive tendering. This process necessitated catering managers spending considerable time preparing for tendering. In addition, financial constraints had been applied to the catering operation.
It was clear during the interview, that the Catering Manageress was aware of HACCP and had a sound appreciation of the principles of both HACCP and ASC.

The manual was designed to be as practical as possible so that it could be used as a working document. It set out defined policies and procedures of work to be followed by catering management, catering staff and other ward based staff involved in the handling or service of food. Procedures included related to :-

(a) Food handlers (including training).

(b) Kitchen structure.

(c) Cleaning (including pest control).

(d) Food preparation.

(e) Deliveries, storage, food preparation.

(f) Meal distribution (including temperature control systems), ward kitchens and social events.
12.4.4 Audit of Application in Practice

Purchase

There was no documented system for the purchasing or checking of supplies, except for a general visual check on the produce being delivered.

Receipt of Food

There was a clearly documented system for the checking, acceptance and/or rejection of food deliveries. Staff permitted to check delivered goods were defined and the parameters which they were required to check were detailed (general quality and damage, weight, use by/best before dates, pest damage or infestation, temperature). Clear criteria for acceptance of goods were defined, as were the procedures to be adopted where products were found to be unacceptable or contaminated on arrival.

During the audit, the specified checks set out in the policy statement were undertaken on deliveries. Examination of records for the previous three months indicated that this was consistently undertaken. A number of incidents where goods were in an unsatisfactory condition or were not at the correct temperature were logged into the records, as was the action taken. This indicated that the proper follow up procedure had been undertaken in each cases. Temperature records revealed a variation in the temperature of delivered goods, and this was consistent with proper temperature measurements being taken.
Staff authorised and trained to receive goods were familiar with the procedures detailed in the manual and were aware of the criteria for acceptance or rejection of food deliveries.

The control procedures for this point within the operation were satisfactory and worked well.

Storage

Detailed arrangements for stock rotation/storage, the storage and use of raw shell eggs, the maximum shelf life of canned goods, and for refrigerated food storage were defined in the food policy manual.

The procedures required :-

(a) All newly delivered stock to be date coded on arrival before being placed into storage.

(b) New stock to be placed behind older stock within store or refrigeration units.

(c) New stock to be placed below older stock within chest freezers.

Once in store, all dry foods were required to be checked weekly for quality, signs of infestation and to ensure that best-before dates had not been exceeded. Examination of all goods within the dry storage area and walk-in refrigerators revealed that the date coding system was
successfully being operated, and that the stock rotation procedures were being followed. Where a best before date was printed on the foodstuff, all were found to be within code.

The policy specified that refrigerated foodstuffs be checked daily for quality and use-by dates. None of the use-by dates had been exceeded, however, there were no records to indicate that this procedure was being followed on a daily basis. The system, therefore, relied on the ability of the manageress to ensure that it was being applied. All walk-in refrigeration units, and free-standing refrigerators within the kitchen area had a temperature dial on them, and all the refrigeration units were checked daily using the external temperature dial. All walk-in refrigeration units contained a temperature data logger and these were down-loaded daily to provide a permanent temperature record. In addition, two Kane-May "Foodcheck" electronic thermometer units were available within the central kitchen, and these were used for reference checks on refrigeration equipment.

Examination of the temperature records indicated that the monitoring detailed in the food manual was being undertaken, and the records showed a variation in the temperature measured, including two incidents where the temperature had risen above 5°C. In both these instances, the Manageress had taken action to ensure that the defect was rectified, and these actions were entered onto the temperature record log.
Preparation

A procedure for the cooking of meat and poultry for hot or cold meals was detailed in the policy. This set out a general temperature standard for cooked meat and poultry and required the core temperature of the joint to reach at least 72°C. Once cooked, it was a requirement that the meat or poultry be served immediately or maintained above 65°C until required (hot food having to be served within two hours of completion of cooking).

If meat was to be refrigerated, the policy required it to be cooled rapidly by blast chilling and then refrigerated to achieve a core temperature of below 3°C within one and a half hours of its removal from the oven.

Temperature records were not kept for preparation. It was not possible, therefore, to determine whether monitoring was carried out on a routine basis. During the interview, the Manageress identified two occasions where inadequately cooked meat had been delivered to the servery in the staff canteen. It had been discovered that the joints had not been cooked and they were, therefore, returned to the main kitchen. During the audit of the main kitchen, the temperature of cooked joints of meat, poultry and other foods were not measured during or after cooking. The standards set out in the food safety policy were not being achieved and the lack of proper management control and monitoring meant that this control point was left to the discretion of the chef on duty.
There was no blast chiller for the rapid cooling of cooked foods. Cooked joints were, therefore, allowed to cool at room temperature for two hours and were then placed into the walk-in chiller unit. The average temperature of such joints when placed into the chiller was 20°C.

Temperature Monitoring

Temperature monitoring equipment was provided in the food delivery area for checking in-coming supplies, in the food preparation area for checking food during preparation, cooking, and storage, and in the staff restaurant servery area for checking the temperature of stored foods. In addition, temperature data loggers were positioned in all walk-in chillers and freezers and were down-loaded daily to provide a continuous record of temperatures within these units. The documented systems within the food safety manual were sound and set specific criteria for what was acceptable. Frequencies for temperature measurement were included, but there was no protocol for such measurement.

Record keeping, particularly in respect of food receipt, refrigerated storage in the walk-in chillers (where the automatic data logger was located) and at the restaurant servery was good. Temperature measurements during preparation, cooking, and service to patients in the wards were not being undertaken. There were no records. Therefore, the maintenance of a proper temperature control chain was failing.
Thermometers used within the establishment were found to be accurate when measured against the calibrated electronic thermometer unit.

Heated food conveyors were provided to transport meals to wards, with the requirement that they maintained a temperature above 75°C.

No temperature records were available for such measurements, nor were there records of temperature monitoring prior to service on the wards. The maximum time between preparation and service to the patient on the wards was measured during the audit as three hours.

Of hot foods delivered to the servery in the staff canteen, random temperature checks, particularly of cooked meats were carried out. Records available indicated that this was done two or three times a day, using an electronic thermometer with a food probe attachment. Records over the previous two months indicated two failures for cooked meats and these related to the incidents which the Manageress had identified during the interview stage of the audit. The remedial action had been noted on the record sheets. Staff were generally aware that they needed to maintain the temperature of food above 63°C.

Cross-contamination

The food safety policy specified steps to be taken to avoid cross-contamination during food preparation. Requirements included colour coding of knives and other implements, in order to ensure separate equipment for cooked and raw foods. Separate work areas were
required for preparation of raw and cooked foods, each having its own refrigerators specifically for that particular category of food. These requirements had been met within the kitchen and because they were well controlled worked well in practice.

Training

On the first day of employment newly appointed catering employees were required to be given induction training into all aspects of the catering department by the Catering Manager. This includes basic instruction on hygiene (including the issue and explanation of a clean food booklet) and the issue and explanation of the personal hygiene policy. Employees, including students, temporary and agency staff were required to sign a declaration that they had "read and understood the contents of the personal hygiene rules".

Newly appointed catering employees were also required to undergo suitable basic food hygiene training, such as the IEHO basic food hygiene course or equivalent, within three months of commencing employment. All other newly appointed employees who were involved in food handling, including "non-catering" food handlers, had to be trained in the particular systems within their work area on their first day of employment. For example, in refrigerator systems, stock rotation, and food preparation. They were then required to attend an induction day or a one hour training session on an introduction to food hygiene within one month of starting work.
Records of induction training and for catering employees undergoing the basic food hygiene training were good. However, other training records were incomplete, and there was no provision for up-date training to take place. The Manageress found the records of training extremely difficult to maintain, and the cost of training high. The training budget rapidly became exhausted. For this reason no refresher training was being undertaken, and it was proving difficult to train staff to the basic level required under policy.

Further barriers to training included the time commitment and there was concern about the practicality of basic food hygiene training. Extensive course evaluation had been undertaken internally. Even after undergoing training, the majority of candidates advised that they would not be changing their method of work, yet 50% could not give the correct refrigeration temperature for high risk foods. Against this background with the cost of a trained person being higher than an untrained person, the whole question of the cost benefit of training was being considered in the light of financial constraints.

Cleaning

Cleaning schedules for each area of the catering kitchen and other food outlets were well developed. Cleaning records were well maintained and this area of the operation was well controlled.
Pest Control

Preventative pest control records were maintained in a pest control book, with regular monitoring visits being undertaken jointly by the Catering Manageress, pest contractor and the local EHO. This aspect of the operation was also well controlled.

12.4.5 Conclusions

Formal HACCP had not been applied within the catering operation, but of the catering establishments audited within these case studies, this establishment had the most developed HACCP approach and was most successful in implementing its procedures in practice. Nevertheless, considerably greater development would be required to meet the HACCP requirement to be introduced in 1995.

The key difficulties identified by the Manageress were the lack of adequate funding for training to underpin the responsibilities and duties set out in the food safety policy and the practical management of the systems within the key areas of the unit. In particular, when key members of staff were not at work there was great difficulty in maintaining the continuity of checks and monitoring.
12.5 CASE STUDY 3 - CATERING AT AN INDEPENDENT RESTAURANT UNIT

12.5.1 Unit Profile

Number of Employees - 10

Food Handling Staff - 9

Number of Meals Prepared - 400 per week.

Type of Meals - Wide range of foods handled and prepared.

Type of food preparation - Primarily cook-chill and regeneration with some cook to order.

Person Interviewed - Company Owner and Chef.

12.5.2 Interview

No formal HACCP system had been applied within the business. The owner and chef were unfamiliar with the HACCP/ASC type concept and were unaware that such an approach would become a legal requirement in 1995.

No food safety policy statement was provided within the business and the organisation and arrangements were left solely to the owner/chef or person in charge. There were no documented systems or records except
for pest control visits. A record book had been supplied by the pest control company together with some rudimentary cleaning lists.

The owner considered that he operated in a safe and controlled way and had taken all reasonably practical steps to protect food safety.

12.5.3 Audit of application in practice

Purchasing

There was no documented system for purchasing or the checking of suppliers, except for a general visual check on the produce being delivered.

Receipt of Food

No documented system existed. Cursory visual checks were carried out on delivered goods, but no temperature checks were carried out on refrigerated items. No records were kept.

Although the chef stipulated that the temperature criteria for rejection of delivered foods was 5°C or more, other staff who were responsible for checking delivered goods were unable to give a temperature limit and said that they would talk to the chef if the temperature was over 8°C.
Storage

The walk-in chiller unit had a ring dial thermometer on the outside and this was used to check the temperature within the unit. Monitoring was on an ad-hoc basis but no records were kept. The owner considered that he would know whether the unit was under temperature or not as he would be able to ascertain this from "the temperature of the food".

Refrigeration units within the kitchen had no temperature dial on them as they were of a domestic nature. They did, however, have a LCD thermometer supplied by the Borough Council. These were placed inside the unit and then used by the owner for checking temperatures. No temperature records were kept.

There was no formal date coding or stock rotation procedure, and it was expected that food handlers would follow good practice as part of their every day work. No "out of code" produce was observed during the audit although there was no correct sequence of products in the storage area.

Separation of raw and cooked food within the walk-in chiller unit was good, although there was overcrowding and the potential for cross-contamination to take place inside refrigeration units within the kitchen area.
Preparation

There were no procedures for time/temperature control during food preparation.

The working space within the kitchen was limited, and there was potential for cross-contamination between raw and cooked foods due to the close proximity of clean and dirty processes. No cross-contamination was witnessed during the period of study and cleaning procedures for equipment were satisfactory.

Cooking

There were no time/temperature standards and control of these factors left entirely to the discretion of the chef. No monitoring was carried out.

Cooling

There were no time standards, cooling being undertaken on an ad-hoc basis, with no blast chiller facility. Cooked foods not to be eaten hot were left at ambient temperature to cool. The Chef advised that this would normally take no more than an hour, and then the joints were transferred into refrigerated storage. The temperature of a cooked chicken and a cooked joint of roast beef cooling at ambient temperature were measured using the calibrated electronic thermometer and found to be 29°C and 31°C at the core, two hours after cooking.
Hot Holding

Hot holding was not carried out, foods being cooked to order.

Re-heating

There was no documented system for time/temperature standards, checks or records and the re-heating process was left entirely to the discretion of the chef or other food handling staff.

Temperature Monitoring

There were no documented temperature monitoring systems and the methods and equipment used were extremely rudimentary. It was clear that food hygiene staff had not been instructed in the use of temperature monitoring equipment. The proprietor did have an electronic thermometer, which although not calibrated, was found to be measuring 1°C lower at ambient temperature, when checked against the calibrated audit thermometer.

Training

Four of the ten staff had attended the IEHO basic food hygiene certificate course and the owner of the establishment had attended the IEHO advanced food hygiene course. No training records were kept, although each of the individuals involved had their certificate framed
and displayed within the unit. There was no formal policy on the training of staff.

Cleaning

A rudimentary cleaning rota was in operation within the unit, with the owner checking the standard of compliance. The general level of cleaning within the unit was poor and no written cleaning records were available.

Pest Control

A record of preventative pest control visits/treatment was maintained in a pest control book supplied by the pest control company.

12.5.4 Conclusions

The operation of this unit is typical of those in many small restaurants and catering facilities.

It was clear that the owner of the business, was not very aware of HACCP and that no HACCP principles had been applied to the operation of the unit.

There was a complete lack of any systemised approach to the operation of the business and consequently a lack of any standards/controls, or records. Given that the owner of the establishment was trained to
advanced level in food hygiene, and that 30% of the staff were trained to the basic food hygiene course level, it is surprising that a greater application of HACCP/ASC approach had not been adopted.

To meet the requirement for the application of HACCP the Company would need to develop systems from a "zero base". It was clear that the knowledge and expertise required to do so was not available within the Company and there would be great difficulty in applying such an approach without a change in attitude and without additional expenditure.

12.6 CASE STUDY 4 - RETAIL DELICATESSEN IN A SUPERMARKET PART OF A NATIONAL CHAIN

12.6.1 Unit Profile

Number of Employees - 14 Full time equivalent, typically 5 members of staff on duty at any one time.

Type of Foods Sold - Raw foods including bacon and sausages, cooked foods including hams, cooked sausages, meat pies, sausage rolls, and cheeses.

Person Interviewed - Delicatessen Manager and Store Manager.
12.6.2 Interview

Both the delicatessen and store Managers were unfamiliar with HACCP. No formal HACCP system had been applied by the Company within the delicatessen area of the unit, and the manager advised that it had not been applied in any of the activities within the store. Neither interviewee was sure whether HACCP was to be formally applied by the Company.

The Company had an operating manual, underwritten by the Chief Executive, which set out the Executive responsibility. Within the manual were elements of a food safety policy statement, although this was not separately set out. Within each unit, the store manager assumed responsibility for food safety.

Written arrangements were detailed for:-

(a) Food purchasing policy.
(b) Training.
(c) Food handler personal discipline and knowledge.
(d) Consumer complaints.

12.6.3 Application in Practice

Purchase
The delicatessen manager was unable to indicate whether the Company had a purchasing policy or not. However, it was clear from the Company manual that such a policy existed, that product suppliers were vetted, and that product specifications were set and monitored. This aspect of the system was undertaken centrally by the Company and the responsibility did not fall to the store concerned.

Receipt of Food

There was no documented system for food delivery, however, foods were delivered by the Company's own transportation from a central depot, and boxes containing these foods all had a large Company label which included a "display until" date stamped on them.

Visual checks were carried out on the delivered goods, however, no temperature monitoring was carried out and there were, therefore, no temperature records. Discussion with the manager revealed that temperature data logging occurred on the delivery vehicle and that records were held centrally.

During the period of audit, one delivery of refrigerated foods (boxes of pre-cooked hams) was observed on a pallet placed in the delivery corridor for a period of an hour. Although the staff advised that the hams had been delivered immediately prior to my arrival, it is possible that the period of time out of refrigerated storage may have been longer. The temperature of the cooked hams was, however, measured at 7°C and they had not undergone excessive heat gain.
There was good separation of raw and cooked food during storage. All the products came in cardboard boxes, and these boxes were placed directly into the walk-in refrigerator. Although there was minimal risk of cross-contamination between raw and cooked food, some of the boxes had a build up of dirt on their outer surface, and this practice introduced contamination into the food storage areas.

The date coding/stock rotation system within the refrigerated storage area worked well. The outer surface of the boxes in which the foods were delivered were marked with the "display until" date code, and goods were stacked in date order. The only exception to this was that approximately one in thirty boxes did not have any date coding sticker attached to them. Although not entirely satisfactory, the store assumed that these boxes would have the same date code as the other boxes delivered in the same batch and treated them accordingly.

Preparation

There were no written procedures for the preparation of various foods on display within the delicatessen area. The main activities involved the slicing of cooked meats, cooked sausages, and cheese. No written work system was used, the general work arrangements being passed from the manager to each of the operatives working within the area. There was no formal training for operatives working in this area, such training being undertaken "on the job".
Slicing of products was undertaken in a batch at the start of day between 7am and 9am. The slicing machine was stripped and washed following this process. Washing of the machine took place in-situ as required during the day, since foods were sliced to order if particular customer requirements demanded this. On busy days, a second batch of slicing was often undertaken in the early evening.

There was no written system for slicing or for stripping and washing of the slicing machine. Examination of the machine during the audit revealed a considerable build up of food particulates and fat on and behind the slicing blade of the machine. By the afternoon, these food particles had become dried to the blade and had clearly been there for a number of hours. There was, therefore, considerable evidence that the cleaning regime for this piece of equipment was inadequate, and given that the ambient temperature was 18°C, there was opportunity for bacterial multiplication to take place within the food particles and, therefore, for contamination of products sliced subsequently.

This method of preparation, did not involve any cleaning of the machine between different food products. There was, therefore, the potential for one contaminated product to cross-contaminate to a whole variety of products within the delicatessen area if they were sliced on the machine. This method of transmission was graphically demonstrated in the Aberdeen typhoid outbreak of 1964 (HMSO 1964).
Chilled Storage

The sliced food products were displayed in a refrigerated display counter with a physical glass partition separating raw and cooked foods. Food unsold at the end of the day was removed overnight and placed in the walk-in chilled storage, although sliced bacon was left within the refrigerated display units.

The manager of the delicatessen was aware that the refrigerated units were linked to a central alarm, but did not know the temperature at which the alarm was triggered. There was no electronic thermometer for checking the temperature of food within the refrigerated display counters, although each of the sections of the display had a thermometer dial at the front of the unit next to the "air on" position.

The manager stated that it had been Company practice to check temperatures using an electronic thermometer, however, this policy had been changed in October 1993, and in each of the refrigerated compartments a liquid crystal display strip (LCD) was positioned amongst the foodstuffs. This produced a glowing yellow symbol when the temperature within the unit rose above a pre-set level.

The LCD strip symbols were only visible from the customer side of the counters and would not be visible to operatives working behind the counter, and the manager and staff did not know at what temperature the LCD strip changed colour. Although there was no written procedure detailing action that they should take if this occurred, the manager
advised me that he would ring the Company refrigeration engineer who would then visit and provide further advice.

There were, therefore, no temperature records of chilled goods within the display units.

Service

Although there was physical separation between the display units in which raw and cooked foods were present, and each of the units was provided with its own set of tongs, the type and colour of the tongs for each section in the delicatessen were identical. There was, therefore, the potential for tongs to become accidentally mixed, those used to pick up raw sausages and bacon then being used for cooked products. This potential was compounded by food handlers moving between different sections to serve customers. There was, therefore, the potential for accidental cross-contamination to occur. During the audit, no such failure was observed.

Staff were not issued with disposable gloves, but used tongs to pick up the foods concerned and place them directly onto a plastic wrapping sheet which was placed on the weighing scales. In theory, therefore, there was no need for food handlers to come into contact with the food, although I witnessed three incidents where this occurred. Unfortunately, there was no wash-hand basin provided at the delicatessen for employees to wash their hands.
Training

All staff joining the Company underwent induction training, including both basic health and safety and food hygiene training. Records of staff training were held in the central main office of the unit, and employees in the delicatessen area received supplementary on-the-job training from the manager of the unit. No refresher training was provided.

Cleaning

Within the delicatessen, the food handling staff were responsible for the cleanliness of the counters and equipment, but contractors were employed to clean the floor surfaces. There were no procedures detailing the chemicals or system by which counters and equipment should be cleaned, and the manager advised me that he would usually use a hard surface cleaner or hot water.

Whilst equipment within the delicatessen area appeared visually clean, there was cause for concern, since without the proper chemicals and their correct application, it was unlikely that surfaces in contact with food, particularly items like the slicing machine, would be adequately cleaned.
12.6.4 Conclusions

It was expected that there would have been a well developed HACCP system in place within the delicatessen given the size and wherewithal of the Company. Whilst there were well developed systems for purchasing and receipt/storage of foods these had not been extended into other "high risk" areas like the delicatessen.

Whilst such an approach had not been extended into the delicatessen it was clear from other areas within the organisation that the expertise and resources were available within the Company to apply HACCP to that work area and to implement work systems not already in place. The operation being carried out was relatively simple in comparison to catering operations and some risks were inherently reduced due to the rapid turnover of foodstuffs.

12.7 CASE STUDY 5 - FOOD RETAILING AT AN INDEPENDENT GROCERY/SUPERMARKET FORMING PART OF A LOCAL CHAIN.

12.7.1 Unit Profile

Number of outlets in chain - 8

Number of employees - 13 Full time equivalent.

Type of Foods Sold - Wide range of prepacked retail foods.
Type of Foods Cooked/Prepared - Spit roast chickens, sandwiches, soup, hot pies/ sausage rolls, toasted sandwiches, and fresh baked bread.

Person Interviewed - Store Manager.

12.7.2 Interview

The Manager had not heard of HACCP or ASC, and neither system had been applied by the Company within this or at any other retail unit within their local chain.

The Company had an operating manual, which included a very small section covering hygiene and customer complaints. There were no operating instructions or work systems with respect to food handling or food safety. Within each unit the unit manager assumed the responsibility for food safety. No written arrangements were detailed for any food safety issues other than for dealing with customer complaints and basic hygiene for operatives.
12.7.3 Application in Practice

Purchase

No quality specification was set out in the Company manual, although the Company operated a system defined as "authorised ranges". This system prohibited the manager from selling any products other than those listed in the authorised range list. All products were purchased by the Company centrally and then distributed direct to the individual stores. The manager was not aware of any of the suppliers of the foods being checked by the Company and this seemed unlikely given the relatively small size of the operation.

Receipt of Food

There was no documented system for the receipt of food. During the audit, a number of foods in the food delivery area were observed in the rear lobby of the unit at ambient temperature. The ambient temperature was measured at 19°C. Some cursory visual checking was made but particular attention was given to the shelf life of the products being delivered. Deliveries were received at least once, normally two or three times per day.

There was no thermometer within the retail unit and no temperature checks were carried out on incoming goods. No temperature records were kept for any goods delivered to the premises.
Although all the foods left at ambient temperature were enclosed in cardboard packaging, the temperature of pre-cooked vacuum packed meats was found to be 13°C.

Storage

There was no documented system for the storage of goods. Chilled and frozen goods were stored in walk-in compartments, whilst dried foods were placed directly for sale in the shop area. Temperatures within the walk-in chiller and freezer were not checked and records were not available.

Goods in the chillers were placed in their cardboard outer wrapping and a number of boxes were found to be contaminated with dirt on their outer surfaces. This practice introduced contamination into the storage areas.

Date coding and stock rotation appeared to be working satisfactorily, however, both storage areas were severely congested and it would have been extremely difficult for a food handler to re-arrange stock, should there have been a delivery of products with a shorter shelf life than those previously delivered.

Preparation

There were no written work systems for the preparation of food. All food preparation took place within a small work area. The main
operations being undertaken were the roasting of raw chickens, the
preparation of sandwiches, the heating of soup, and the toasting of
sandwiches.

All of these activities took place within this confined space and there
was a high potential for cross-contamination between raw chickens and
other foods to occur. There were no written procedures for the
frequency or method of cleaning within this area, this being left to
the discretion of the food handler in charge. One food handler was
responsible for all activities in the area, including the handling and
preparation of raw chicken, and subsequently the handling of other foods
within the unit.

Cooking

There were no time/temperature standards set for the cooking of any of
the foods prepared. The method for cooking raw chickens, which the food
handler followed, was to place them into a roasting oven where the
temperature was preset at a 160°C for one hour and fifty minutes. This
procedure had been passed on to her by her predecessor and she was
unsure why this time and temperature had been set. This combination was
used irrespective of the weight of a particular bird.

Temperature control relied entirely on the digital temperature dial
present on the oven. There was no automatic timer on the oven to
prevent it being opened until the correct time and temperature had been
achieved. After cooking, the chickens were placed in a hot display
cabinet whose temperature dial was set to 85°C. No temperature checks were carried out on the temperature of the unit or the foods within it.

The system relied entirely on the accuracy of the thermostatic switch on the unit to maintain the correct temperature. Using the calibrated electronic thermometer unit, I measured the temperature of three cooked chickens within the unit which were 51°C, 52°C, and 55°C. The remaining chickens were all at a temperature of 62.9°C.

Chickens were cooked every day and those unsold at the end of trading were allowed to cool, on the work surface at ambient temperature, for approximately one to two hours. They were then wrapped in foil and placed into the walk-in chiller. The next trading day, the chicken was cut up and used in the preparation of chicken sandwiches.

Chilled Retail Display

A variety of chilled display units were present in the store. Each of the units had a temperature display dial, however, it was unclear where the temperature sensor was positioned within the units.

Although there was no system for checking the temperature of food within these units, staff placing foods for sale checked the temperature on the dial as they did so. Whilst the temperature dial on each of the units indicated a temperature of 4°C, all of the units except for one were holding food at 9°C when food temperatures were checked with the calibrated electronic thermometer unit. The remaining refrigerator
display maintained a food temperature of 5°C at the top of the unit, but food at the base of the unit was at a temperature of 19°C. Foods in this higher temperature zone included sausages and chicken pieces.

A self-service refrigerated "salad bar" was used in the shop and customers could spoon the size or portion that they required into a plastic container with a clip-on top. The foodstuff thereafter being weighed before payment. Examples of foods available from this unit included cooked sweetcorn, fresh fruit salad, taramasalata, and coleslaw.

The temperatures of individual foods displayed in plastic tubs within the unit were measured using the calibrated electronic audit thermometer unit. Fresh fruit salad was found to be at a temperature of 19.6°C. Other foods within the unit were at temperatures between 2°C and 6°C. Although the unit was able to maintain a refrigeration temperature for foodstuffs that had already been chilled, it appeared that foods prepared at room temperature without prior chilling could not be brought down to temperature by the display.

Foods were displayed in the unit inside open topped plastic tubs. When these tubs became empty, the container was discarded and a fresh full tub was taken from the walk-in chiller to replenish the display.

The self service operation had the potential for contamination of foodstuffs to occur during the course of the day, as a result of customers coughing and sneezing, and via contact with customers hands.
In the event of such contamination, the potential for microbial growth in the foodstuffs was increased as a result of inadequate temperature control and the practice of holding overnight.

There were no defined limits as to how long such products should be on sale, or how many times they should go through the store/display cycle. There was, therefore, the potential for temperature shock to occur.

Training

There was no formal training policy within the Company and although two of the employees had previously worked in catering, no particular qualification or level of training was specified for any new employees. There were, therefore, no records for the training of staff.

Cleaning

There were no proper procedures, schedules, or records and cleaning was done purely on an "as required" basis based on the judgement of the manager.

Pest Control

The Company employed a pest control company on a contract basis, and a record book was present, detailing the visits that had been made by the pest control company, the action they had taken, and their findings.
There was no evidence of any pest infestation, and the pest prevention programme appeared to be satisfactory.

12.7.4 Conclusions

Although a relatively small retail outlet, certain activities carried on within the retail unit had a high potential risk, and were being carried out on an "as you go" basis, without the application of HACCP, ASC or similar system.

There were no formal or documented work systems within the business, the entire operation being dependent on the standard set by the manager. In the case of the cooking of chickens, the system had not been based on any objective safety assessment.

Temperature monitoring and control within the operation was extremely poor, and this together with the low level of training, provided a high potential for food safety failures. The application of a HACCP type approach to the operation would provide an essential basis for controlling critical areas such as temperature control. The lack of expertise, knowledge and resources within this organisation would however be a strong barrier to the implementation of such a change.

12.8 DISCUSSION

The case studies undertaken revealed a greater awareness of a concept of HACCP than the Government's ASC approach. As might be expected, there
was a greater awareness and application of HACCP/ASC amongst larger retailers and caterers, however, even in these establishments a HACCP type approach had not been applied to the degree expected. In small establishments audited in case studies 3 and 5 the knowledge and application of HACCP/ASC was almost non-existent.

Elements of a HACCP/ASC type approach had been adopted by the companies in case studies 1, 2 and 4. In each of these, the company or organisation involved was relatively large with extensive financial, technical and scientific resources. It was surprising, therefore, that even amongst these establishments with comparatively well defined food safety policy systems, the application of HACCP/ASC was only partial and in every case implementation was failing, largely due to a lack of management control.

Procedures set out in policies were often not well defined, but where basic procedures were in place there was a general lack of management control to ensure that these were being followed in practice.

With the exception of the hospital in case study 2, none were aware that HACCP was to become a legal requirement in 1995.

It was clear from interviews with key managers in all the organisations audited that there was poor awareness of HACCP. Whilst it is understandable that the majority of food handling staff may be unfamiliar with the concept it was surprising that there should be such a lack of awareness amongst managers responsible for food safety. Given
that such managers would play a key role in the development and/or implementation of a HACCP system there was a clearly need for a substantial improvement in training amongst this supervisory tier.

It could be argued that within larger organisations, a HACCP system could be developed centrally and, therefore, local managers and staff need not necessarily have a working knowledge of the system, provided that the procedures detailed were followed. This rationale was not, however, sustained in the case studies undertaken since the food safety system was incomplete. Without a sound knowledge amongst local managers having responsibility for its implementation it is unlikely that any system would be effective.

In those establishments where HACCP had been implemented, these perceived difficulties appeared to create a psychological barrier amongst those responsible. This arose as a result of the complexity of design and implementation. This barrier seemed to deflect effort in implementing the system within key work areas. For example, amongst caterers, all had a policy for purchasing food and undertook checks on food being delivered to the business, particularly in respect of date coding. Although this is very laudable, the system for ensuring continuity of temperature control throughout the catering process was not generally so well defined, or if defined was not so well implemented. In overall importance, therefore, disproportionate effort had been expended to a part of the control process, which in terms of food safety was less important than other key areas in which little effort had been applied. From a cost effectiveness point of view,
therefore, businesses had failed to adopt the approach in the correct fashion.

This syndrome may also reflect the comparative ease with which incoming goods may be checked, whereas the control of temperature throughout the operation is a much more complex issue. There is also, a significant financial incentive to check incoming goods to ensure that value for money is achieved in purchasing.

In the key area of temperature control, there were considerable gaps in the maintenance of a refrigeration chain from "delivery" to "sale" of food. A disproportionate degree of attention was generally given to monitoring refrigerator and freezer temperatures, whereas, little or no attention was given to ensuring adequate time/temperature combinations during preparation, cooking and subsequent chilling or hot holding. This again may be a reflection of the relative ease with which temperatures within refrigerators and freezers can be checked especially if a temperature dial is incorporated within the equipment. Of concern, however, is the fact that suitable temperature monitoring equipment was not available amongst the establishments to allow correct temperature measurements to be made.

With the exception of the work procedures in the company audited in case study 2, there were few controls to prevent cross-contamination at all stages during production. Application of the HACCP/ASC concept in both catering and retailing establishments would identify critical areas where controls were required. Unfortunately, in the establishments
audited, major factors, such as temperature control and cross-contamination were not being properly addressed because there was a lack of awareness and lack of a good management control system. For this reason, the systems applied were not as effective as they should have been.

The establishments were audited using a checklist which was designed using the system defined in the Government's ASC system (HMSO 1993) and was found to be effective and practical in identifying major factors within each of the establishments audited. The application of this type of approach by retailers and caterers is, therefore, considered to be suitable and practical. It would contribute significantly to addressing important areas within food businesses. Unless, however, there is a significant improvement in the awareness and level of training, it is likely that this approach would be ineffective because resources would be directed towards areas perceived as being important or easy to measure and control at the expense of critical points within the operation.

In those establishments where a HACCP approach had been adopted the main concerns were about costs, both financial and time, and the practical difficulties of maintaining adequate management control. In case study 2 in which a greater application of HACCP was found, many aspects within the control system depended upon the presence of a particular individual within the organisation. If that individual was absent or not available, then many of the checks and controls were not applied. These concerns were also apparent amongst those interviewed in establishments
where the HACCP approach had not been adopted. In these establishments the strict application of HACCP was perceived as at best a "considerable burden", and at worst of being of "little benefit".

The strict application of HACCP within the establishments audited would have significant implications in terms of time, both in its application and then implementation. This was particularly the case within catering establishments where a complex series of processes were undertaken. An ASC approach would, however, provide a more practical and effective method more likely to be implemented.

12.9 CONCLUSIONS

The findings of the five audits undertaken in this study, indicate that:

1. There was a complete lack of awareness of HACCP/ASC within the small retailer audited. This finding is considered to be representative of a high proportion of food establishments of this type.

2. There was greater familiarity with the HACCP approach than with the concept of ASC.

3. There was a greater level of awareness and implementation of HACCP/ASC amongst caterers, particularly those who were part of a large organisation than in the small caterer audited. Even in these establishments, implementation was only partial and there were
major failings in the systems being operated.

4. The implementation of the ASC approach is considered to be more likely to be implemented than HACCP, particularly in the catering sector. It is, however, considered to be an important means to address key food safety issues in both retail and catering establishments provided it is properly implemented and controlled.

5. There was a general lack of awareness of HACCP/ASC and a clear need, for greater training amongst caterers and retailers.

6. Where systemised approaches had been introduced, many of these were failing, even amongst the larger organisations, due to a lack of management control.

7. There is a considerable gap to be bridged in order to move from the current position to one where HACCP/ASC is being widely and properly applied within catering and retailing.

8. Unless these fundamental weaknesses are addressed and corrected, the new legal requirement is likely to be ineffective.
REFERENCES


CHAPTER 13 DISCUSSION

13.1 INTRODUCTION

The new framework set out in the Food Safety Act 1990 introduced the first major changes to food safety control this century. These changes affected both the food trade and enforcement agencies alike. Their introduction also coincided with an acceleration of new European Community hygiene controls in preparation for the open market, the pressures of the economic recession, and the Government's policy of deregulation.

Within such a volatile climate, it is not surprising, therefore, that there has been criticism of the cost of this "new" policy, and in particular complaints about over-regulation, and over-enforcement. Set against a continuing rise in food related illness, these criticisms have fuelled demands, particularly from industry, for a more systematic, cost-effective and "deregulated" approach to food safety using the general framework of the Food Safety Act. Such ideas have found political support for a shift in policy away from the traditional regulation/enforcement approach to one spearheaded by the application of a HACCP based approach together with training, Industry Codes of Good Practice and greater self regulation.

The success of such a policy in practice will be heavily dependant on a number of factors including :-
(a) Retailers and caterers perceptions of food safety and whether these perceptions can be changed.

(b) The level of expertise and knowledge of the HACCP approach amongst retailers and caterers.

(c) The willingness of retailers and caterers to adopt this type of approach.

(d) How readily a HACCP type approach can be applied in practice.

(e) The effectiveness of training.

(f) The ability of caterers and retailers to meet any additional costs.

(g) The effectiveness of Industry Guides and greater self regulation.

This study has examined these factors and has provided a snapshot of retailers and caterers perceptions of food safety issues and the effects of the Act on their businesses. In addition, it has provided information on a variety of food safety issues.

The study took place during 1993 some 24-30 months after the Act came into force. Whilst, therefore, the provisions were still in the process of implementation, sufficient time had elapsed for most retailers and caterers to be aware of its effects and any shortcomings. The study identified how retailers and caterers dealt in practice with key issues
such as temperature control and cross-contamination. In addition, retailers and caterers views on training and HACCP have been examined together with the action taken by them to date regarding these issues. By examining the current safety controls being applied and the general "culture" within these sectors, potential barriers to the "new" approach to food safety have been identified. These provide an indication of how practical such an approach is to implement and, therefore, how effective it is likely to be.

This discussion critically reviews the methodologies used. The findings of the studies are then considered in the context of five main subject areas:

1. The new enforcement framework.
2. The effectiveness of regulation/deregulation.
3. HACCP.
4. Training.
5. Changes of approach in the food safety system.

13.2 A CRITICAL REVIEW OF METHODOLOGY

13.2.1 Rationale

The objectives of this thesis were set out in Chapter 1. In Chapters 2 to 7, changes within the retail and catering sectors and the types of food related illness, their incidence, causes and costs have been reviewed.
The changes introduced by the Food Safety Act 1990 and supplementary legislation designed to prevent illness have been described in Chapter 8. To examine the effects of these changes together with the key areas of HACCP, training, temperature control, and cross-contamination, a postal questionnaire was distributed to 3427 retailers and 3181 caterers within England and Wales. Response rates of 30.3% and 26% respectively, provided 1040 retail questionnaires and 828 catering questionnaires. The methodology used in this study has been described in Chapter 9 and the results detailed in Chapter 10.

Requirements for training and the adoption of a HACCP based approach are set out in new regulations (HMSO 1995) and form the spearhead of the Government's policy. These two areas, which were examined in the postal survey, will be central to the success of this policy. It was, therefore, considered that these issues should be considered in greater detail to examine the effects of these new statutory requirements.

There is a general view that training is important in the prevention of food related illness (Richmond 1990). This view has clearly been accepted by the Government. The findings of this study indicate that most retailers and caterers also share this view. However, the findings also indicate that increased training was only partially successful in producing a significant corresponding increase in the awareness of the major causes of food related illness.

To examine further the value of basic food hygiene training in improving awareness of these causes, a second study was undertaken on 235 food
handlers to examine the effect of the IEHO Basic Food Hygiene course on their awareness of the major causes of food poisoning. This study has been described in Chapter 11.

The application of HACCP in retail and catering operations is widely advocated as a means of preventing food related illness and will become a legal requirement in September 1995 (HMSO 1995). The findings of the postal survey indicated that retailers and caterers did not consider HACCP to be as important to the safe operation of their businesses as other factors. Further, although many indicated that they operated control systems for factors such as temperature control, the response to other questions indicated that these systems were failing or inadequate.

Whilst 39.9% of caterers thought that the application of an HACCP approach was practical or very practical within their business, almost as many (37.5%) did not know and over a fifth (22.8%) thought it impractical. Against this background, case studies were undertaken in 2 retail and 3 catering establishments of different sizes to examine the extent to which a HACCP type approach had been adopted, how practical this had been to operate, whether such an approach could be adopted, how difficult it would be to apply, and any barriers to its successful implementation. The findings have been described in Chapter 12.

The methodologies adopted within these studies are reviewed within this section.
13.2.2 A study of the effects of the Food Safety Act 1990

Whilst the number of returned questionnaires and their geographical distribution are considered sufficient to provide a representative picture of retailers and caterers in England and Wales the following factors must be considered in drawing conclusions from the data obtained:

(a) The methodology used to distribute questionnaires was not truly random. Distribution was dependant on LAs returning names and addresses.

(b) Whilst lower than the return achieved in the pilot studies, the number of returned questionnaires was considered sufficient to provide a representative sample from which conclusions could be made. At the time the survey was undertaken some 221,113 retailers and 347,135 caterers were registered as food premises under the Food Safety Act 1990 (MAFF 1994). Questionnaires were, therefore, distributed to 1.55% (3427) of all food retailers and 0.92% (3181) of all caterers within England and Wales. The 1040 returned retail questionnaires represented 0.47% of all food retailers and the 828 returned catering questionnaires 0.24% of all caterers in England and Wales.

(c) The results of the study probably represent a more "optimistic" picture than that which actually exists since responsible proprietors were more likely to have responded to the survey.
Questions where respondents had to indicate the importance of a factor by ticking a particular answer box were not found to provide clear information as there was a tendency to simply tick the "important" box in each case. Questions requiring the respondent to answer a question by prioritising the factors required the respondent to be more discriminating and provided a clearer response.

The response to some questions in the pilot studies indicated that they would provide interesting differences for the comparison of different types and sizes of establishment. However, in the final questionnaire the response did not exhibit the same differences. A larger sample in the pilot study may have helped to identify this and these questions could have been replaced with alternatives.

Heavy emphasis was placed on the key areas of HACCP, temperature control, cross contamination, and training.

13.2.3 A study on the effects of basic food hygiene training on the appreciation of the principal causes of food related illness

In this study, 215 candidates from the catering trade were asked to complete the questionnaire. Whilst the IEHO course is only one food safety course, it was demonstrated to be the most commonly attended by retailers and caterers in the study described in chapters 9 and 10. Further, some 221,757 candidates attended the course in England and Wales during 1993 (CIEH 1994). The effectiveness of this and other comparable courses which have a similar content and are run on a similar basis could have a significant impact on food safety practices.
Candidates attended the course at only two venues, both in the same locality. The results may, therefore, be influenced by particular emphasis being given to certain topics by the lecturers. Further, the study did not include a follow up assessment to examine any improvements that occurred in practice.

The study was, however, undertaken in a "live" situation, the candidates booking onto the course prior to the study being undertaken and without any prior knowledge of it. In addition, the course content is uniform across England and Wales and standard course notes, materials and supplementary exhibits were used.

The awareness of the major causes of food poisoning is considered to be a valid indicator by which to judge the effectiveness of the course. Any practical changes candidates may make as a result of the course are unlikely to be effective in preventing food poisoning unless they relate to these major causes.

However, whilst improved awareness of other factors may not have the same level of impact in preventing food poisoning, it may nevertheless result in a general improvement in practices and, therefore, in better food safety standards.
13.2.3 Case studies on the application of HACCP in retail and catering establishments

Whilst only five case studies were undertaken and the selection of establishments was not truly random, the establishments audited are considered to be representative of typical businesses in their respective sector.

In reality the findings of the audits are likely to represent a more optimistic picture than that which actually exists since the audits were undertaken with the co-operation of the proprietors. In addition, none were carried out in ethnic establishments where there may be language and communication barriers.

13.3 ENFORCEMENT FRAMEWORK

13.3.1 Effects of the Act

Criticisms of changes perceived to have resulted from the Act relate primarily to over-regulation (Daily Telegraph 1993), overzealous enforcement (North 1994), and a lack of uniform enforcement. Although some of the difficulties initially encountered have now been resolved, enforcement of the Act is still perceived to be a burden by a small proportion of businesses (DTI 1994). Given the major changes it introduced and the prevailing economic climate this is not surprising.
The results of this study show that only 23% of retailers and 19.1% of caterers considered the effects of the Act on their business to be "considerable" or "major". Most, 36.9% of retailers and 40.3% of caterers, thought that it had had "little" or "no effect". These findings suggest that the impact of the Act was not as substantial as may have been portrayed in the media.

The impact was considered to be greater by a significantly higher proportion of retail and catering managers/manageresses than by the owners of retail and catering businesses. This suggests that the Act had a greater impact on the practices and operation of such establishments where managers/manageresses would have a greater day to day involvement.

13.3.2 Enforcement Powers

Where food safety inspections had been carried out since the Act came into force it was found that 14.6% of retailers and 14.1% of caterers had received INs as a result. Whilst no information on the content of these notices was elucidated, this does suggest that the proportion of instances where notices were unreasonably over-burdensome is likely to be low and represent the exception rather than the rule.

The proportions of retailers and caterers indicating that they had received INs were higher than the respective 3.8% and 4.8% levels recorded in the 1993 Food Control Statistics (MAFF 1994). This could indicate that the sample of returned questionnaires came from "less
"compliant" establishments, although such establishments are less likely to have returned the questionnaire.

The change in Government advice on the use of INs (HMSO 1991"), has been reflected in a reduction in the number of establishments being served with notices. The percentages of both retailers and caterers served with INs in 1993 reduced from the respective 5.6% and 8.2% in 1991 (MAFF 1992).

This study showed that the majority of retailers (73%) and caterers (84%) considered INs to be more effective than written advice in making them carry out any necessary remedial measures. This indicates that such notices are likely to act as an effective enforcement tool and achieve a good level of compliance. There are no published statistics to enable a comparison of the relative compliance with INs and written requirements. Comparison of statistics of notices served at Guildford since 1990 has shown better full compliance levels for INs (87%) than for advisory letters (59%). Since changes in Government advice in 1993, however, the numbers of establishments served with INs has reduced to only 25 per year (2% of food establishments).

13.3.3 Due diligence

This important new legal defence, shifted the onus of proof from the enforcement officer to the proprietor of a food establishment who now needs to establish that he took all reasonable precautions and exercised all due diligence to avoid the commission of an offence. This concept
is closely linked to a HACCP system in that such a system when operated meets the due diligence requirement.

Some 44% of retailers considered the "due diligence" requirement to be effective in preventing food poisoning. Arguably the retail sector may have had more experience of the defence and be more likely to consider it important.

Since due diligence and HACCP have a number of common considerations both are discussed within the section on HACCP later in this Chapter. It is disappointing, however, that a greater proportion of retailers did not consider due diligence to be effective in preventing food poisoning.

13.3.4 Registration/Licensing

Richmond (1990) recommended that a system of formal licensing and prior inspection should be "extended to a wide range of food operations including all catering establishments and those premises carrying out butchery and processing of meat". This recommendation has not been implemented, however, a registration system has been introduced (HMSO 1991¹). Registration cannot be refused and a number of exemptions have been introduced. For example, childminders caring for less than 6 children do not need to register.

Whilst a food business may not need to register it is still subject to inspection under Food Safety legislation although how enforcement authorities will know of the business is unclear. Many home catering
businesses operate without registration and often cater at events such as weddings. Catering for weddings and similar functions have a high potential risk and are often associated with outbreaks of food poisoning. It is significant, therefore, that such businesses if operating from "domestic" premises need only meet a reduced standard under the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995).

Although the current registration system is generally regarded amongst enforcers as having been beneficial, as it has brought to light some previously unknown businesses, many consider maintaining the register a burden which outweighs the benefits (Pill 1993). In general the system is regarded by enforcers as being ineffectual and without real "teeth".

The results of this study show that Richmond's view on the need for a licensing system is supported by retailers. Some 53.7% felt that a licensing system would help to prevent food poisoning. Although 25.4% felt it would not, the response does indicate that there is a strong measure of support amongst this sector of the food trade for such a system.

It would have been helpful in the questionnaire to have sought views on the effectiveness of the current registration system this shortcoming was identified earlier in this Chapter.
13.3.5 Temperature control

The two new temperature control requirements introduced in 1991 and 1992 have been the subject of review in Chapter 8. These controls are to be replaced by new provisions set out in the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995), which contain a general requirement to keep foodstuffs "likely to support the growth of pathogenic micro-organisms or the formation of toxins below 8°C or at temperatures that will not result in a risk to health". The hot holding requirement remains at 63°C. This improves the confusing two tier controls and removes the list of relevant foods which were generally confusing and difficult to enforce. The controls do not, however, take precedence over product-specific requirements set out in product specific Directives. This general statutory requirement is again to be backed up by voluntary guides to good hygiene practice. The new requirements will come into force at a later date than the rest of the regulations as the temperature provisions have yet to be agreed by the EC.

13.4 REGULATION/DEREGULATION

The traditional approach to food safety has relied heavily on regulatory controls and inspections in order to maintain standards. In retail and catering establishments the principal hygiene controls are set out in the Food Hygiene (General) Regulations 1970 (HMSO 1970). These regulations, discussed in Chapter 8, prescribe minimum standards for premises, washing facilities, equipment, food handlers, and work
practices. They are primarily concerned with securing a minimum standard for the structure of food premises and the equipment within, but include some controls over the conduct of food handlers.

The regulations are fundamentally weak having been formulated before the emergence of many new processes and microbiological hazards. Despite the fact that the most common factors implicated in outbreaks of food related illness relate to failures in operation rather than the surroundings (Roberts 1984), the regulations are almost exclusively concerned with standards of construction and equipment at the expense of hygienic working practices. Unfortunately, compliance with the regulations has widely been seen by the trade and by enforcers as an end in itself whereas they actually prescribe a minimum standard which should in practice be exceeded. The focus has thus wrongly been placed on the environment rather than the process.

This traditional approach has also disproportionately shifted the responsibility for food safety from inside food establishments to outside enforcement officers (Matthews 1986). The vaguely worded requirements of the regulations use terms such as "satisfactory", "adequate", "acceptable", and "suitable", and leave the question of what is acceptable to individual inspectors. This has produced inconsistency in enforcement which has undermined the credibility of enforcement officers and has brought the law into disrepute.

Change to a more formal enforcement approach introduced by the Act and Statutory Codes of Practice highlighted the inadequacy of the
regulations. The use of INs to secure compliance with them resulted almost exclusively in notices concerning structural matters. This highlighted inconsistencies in enforcement and led to enforcement officers being criticised and accused of being overzealous (North 1994) and overly concerned with structure rather than practices. Whilst these inconsistencies are in reality small in number, they reflect the inadequacy of the regulations and the shortcomings of the traditional approach to food safety. They also exemplify a legacy which the regulations and this approach has left, namely the myth that clean premises are automatically hygienic premises. This has resulted in the real causes of food related illness being largely ignored whilst disproportionate attention and resources have been directed towards structure and equipment which are less important in preventing illness.

Since a great deal of food safety training is based around this traditional system such a notion is perpetuated in many forms of formal hygiene training. This view is supported by the results of the studies described in Chapters 9, 10 and 11 and is discussed later in this Chapter.

Evidence relating to outbreaks of food poisoning implicates inadequate time/temperature control, and/or cross-contamination in most cases (Roberts 1984). Adequate control of these two factors alone could, therefore, substantially reduce the level of illness in England and Wales. The results of this study showed that less than half of all retailers considered inadequate temperature control or cross-contamination to be a major cause of food related illness, and
only 33.1% identified both as major causes (Table 10.1). A similar perception was found amongst caterers, where 51.9% thought inadequate temperature control and 56.3% cross-contamination to be major causes. Some 39.8% thought that both were major causes.

Essentially, the shortcomings in current Regulations fall into two broad groupings. Firstly the requirements are non-specific and, therefore, unclear and open to differing interpretation. There is evidence, not just in the field of food safety (Sanger 1994), but also health and safety (HSE 1994) that rather than deregulation what many proprietors are actually seeking is more specific and, therefore, clearer requirements.

The second shortcoming is that the regulations fail to address the essential issues of good practice, and fail to relate requirements to the hazards and risks involved.

There has been considerable criticism of the so called "floors, walls and ceilings" approach to inspection and as a result a clear direction of emphasis away from such matters has been given by the DOH and LACOTS. Consequently, in practice, talk of structure has almost become regarded as unprofessional. Whilst practices are fundamental to food safety, structure also plays an important role and the two can be so interdependent that it is essential that structural standards also be maintained. A better balance between the two is of paramount importance.
To a great extent, it is not the regulation/enforcement approach that is at fault but the failings of the existing regulations. These shortcomings need to be rectified, but do the new regulations address these?

As was discussed in Chapter 8, the control of practices has been addressed in new Regulations (HMSO 1995) by the inclusion of a provision requiring a HACCP approach.

In respect of the clarity of regulatory requirements, the Food Safety (General Food Hygiene) Regulations 1995 (HMSO 1995) repeat a great number of the current provisions. Vaguely worded requirements in current regulations such as "suitable", "sufficient", and adequate" are to be replaced by equally nebulous terms such as "adequate", "appropriate", "where necessary", and "where appropriate". Sadly, there is, therefore, no reason to suggest that differences of interpretation will not continue to occur. Inconsistency in enforcement is, therefore, also likely to continue. There is consequently a need for national guidance on the appropriate interpretation of the regulations on the basis of that provided by LACOTS.

Industry Codes of Good Practice currently being produced are intended to address this and act as guides to compliance with the regulations. These will not be mandatory and there will be "no legal requirement that every member of the food industry must follow the guides" (DOH 1994).
A draft catering industry guide (JHIC 1995) has been produced for consultation. Whilst this provides a useful baseline interpretation of the regulations, and in particular of the training requirement, many aspects are as open to interpretation as the regulations themselves.

The success of Industry Guides will depend on their credibility with both trade sectors and enforcers alike. It remains to be seen whether they provide more clarity to legal requirements, but in the field of Health and Safety, where this system has operated for many years, experience suggests that the credibility of such guidance is often questioned, sometimes even by those responsible for its drafting.

There is, therefore, a substantial element of doubt about how successful such an approach will be in improving food safety and preventing food related illness.

13.5 HACCP

Hazard Analysis Critical Control Point (HACCP) has been widely promoted as a suitable cost-effective food safety mechanism. The World Health Organisation advocates its implementation throughout the food chain (Codex Alimentarius Commission 1991), and Richmond (1991) made frequent reference to HACCP and recommended to Government "that all food processes should be designed on the HACCP approach". The European Community has made its adoption a legal requirement in member states (EEC 43/93), and this requirement is to be implemented within UK hygiene regulations in 1995 (HMSO 1995). Food businesses will have to assess
and control potential food hazards on the basis of principles used to develop the system of HACCP. A formal documented HACCP system is not required for all food businesses.

Guidance to enforcement officers (HMSO 1994) advises that "in certain high risk businesses and operations, a formal, documented hazard analysis system based on specialist advice may be necessary to establish effective controls. Enforcement officers may, therefore, wish to encourage documented hazard analysis systems in such situations although a documented system would not be an express legal requirement".

Since high risk businesses are not defined, there will inevitably be disagreement over which businesses require a formal documented system. Advice in the draft catering guide (JHIC 1995) is that "the regulation does not demand fully documented 'classic' HACCP or written records of monitoring". It does advise, however, that written records would be useful in establishing a due-diligence defence.

Without a documented system it is hard to see how the adequacy of controls can be established by enforcement officers. The effectiveness of this new provision in practice must, therefore, be questioned. Although the regulations place a clear duty on proprietors, in reality, the Code of Practice and draft industry guide ameliorate this, and shift the emphasis away from requiring a formal system, thus once again placing a greater onus on enforcers.
Within catering establishments the Government has advocated the use of the "Assured Safe Catering" (ASC) system (HMSO 1993") which utilises "generic control points". Although this is less onerous than strict HACCP it embodies the same basic principles and still has important implications for businesses and will involve a significant change in the "culture" within catering.

One of the benefits of formal HACCP is the safety assurance it provides, whereas the generic nature of the ASC approach may lead to a false sense of security. Is, therefore, the ASC approach the correct one to adopt?

In the case studies, two commonly identified barriers to HACCP were the cost of implementation and the management control of the systems involved. Whilst these systems might be considered to be prerequisites in good retail and catering practice there was a perception that they involved considerable work and there seemed a lack of enthusiasm for their implementation.

The case studies undertaken in this study indicate that there is a sound basis to this concern and that the strict implementation of HACCP in retail and catering establishments could be extremely onerous, particularly in smaller establishments without the resources of a large company. The adoption of generic control points on the basis of an Assured Safe Catering (ASC) type approach approach is, however, considered to be both practical and successful in controlling risk.
In the catering industry there is little uniformity of systems and a
great variety of foodstuffs. These are very powerful influences
against formal HACCP, but are they justified? Whilst consideration of
individual foodstuffs may initially be difficult and time consuming, the
process often becomes easier with subsequent foodstuffs since much of
the earlier work is easily transferred.

In some areas of catering, particularly fast foodstuffs, production is
highly systemised and there are a relatively small number of foodstuffs
involved. In such establishments it is relatively easy to apply formal
HACCP. Where the establishment is part of a national company there is
normally financial and technical support. In reality, however, most
catering businesses are small independents without the wherewithal of
large companies and who by their nature use and produce a wide variety
of foodstuffs. In these establishments a requirement to implement a
formal HACCP system would have significant repercussions and would
almost certainly result in many businesses having to close. Such a
situation would be politically untenable.

It is important that good catering practices are in operation before
formal HACCP is introduced. HACCP needs to build on the existing
procedures otherwise it can lead to significant disruption of work
routines and may, therefore, compromise food safety until operating
fully. Evidence from these studies suggests that good practices and
work systems are not widely in place amongst caterers.
Against this background, the adoption of the ASC approach is considered a more practical and achievable short term objective which is an improvement on the traditional approach. It should, however, be seen as a step towards a requirement for full HACCP and in this respect it is regrettable that there is no provision for written documentation since this undermines the approach.

If this type of approach is to be successful then prejudices and deeply entrenched attitudes which form a barrier to food safety will need to be dispelled. This task will not be easy. Catering is essentially a craft industry where standardised work methods are the exception rather than the norm. Moreover, the social organisation of catering its culture and practices provide a barrier to radical change. For example, at a HCIMA working party on BS 5750 it was suggested that quality systems such as HACCP were "irrelevant", that they were "no more than a marketing tool", that "customers don't like regimented procedures to achieve quality", and that a BS 5750 type scheme would dehumanise staff" (Wilson 1992). The application of HACCP has, therefore, far reaching implications not only for food safety but also for the structure of the industry.

Retailing, although less problematical than catering in terms of technical requirement, is in practice more involved than may appear at first glance. Modern retailing practice involves the sale of a wide range of highly susceptible products requiring refrigeration. Most retail outlets sell some pre-cooked, pre-prepared, or ready-to-eat foods which depend on the maintenance of chill temperatures to ensure safety. In addition, other activities such as delicatessens, bakeries,
butcheries and the manufacture and sale of sandwiches and hot snacks are commonplace amongst retailers trying to sustain their business in the face of harsh competition and in the inclement financial environment.

This study has shown that the proportion of retailers (57.7%) and caterers (70.1%) who considered HACCP to be important to the safe operation of their business was significantly lower than all other factors (Table 10.4, Table 10.6).

The study also showed that a significantly higher proportion of managers in both retail and catering sectors considered HACCP to be important and within the retail sector the bigger the size of the business the greater was the importance attached to HACCP.

Although 39.9% of caterers thought the implementation of HACCP was practical, the actual level of implementation indicated by the presence of work systems was very low in both retail and catering sectors. None of the retailers or caterers had a written system in place for temperature monitoring, staff training, stock rotation and pest control. This is supported by the findings of the case studies undertaken in retail and catering outlets.

The lack of application of a HACCP approach indicated by the postal survey and confirmed by the case studies is the result of:

(a) A lack of management commitment particularly at a senior level.
(b) A lack of knowledge/training.

(c) A lack of financial and manpower resources.

The lack of management commitment may stem from a failure to appreciate the importance of quality costs (Dale and Plunkett 1991). Therefore, there may be no perceived profit incentive to invest in HACCP.

The level of training in HACCP was low in retail and catering sectors. Among retailers the number who indicated that they had given in house staff training (20.5%) was lower than for all other subjects. There was evidence that where staff had been trained, a significantly higher proportion recognised HACCP as important.

The HACCP based approach is perceived to concentrate business and enforcers on risk control, and thereby to reduce the need for regulation. This approach is commendable but will it work in practice? Larger organisations in a position to lobby heavily are keen to adopt such an approach perceiving it to be an argument in favour of deregulation. In reality, there has been nothing to prevent such companies from adopting such an approach previously. However, the case studies carried out show that such an approach has at best been only partially adopted and even then is not implemented fully in practice.

This study indicates that the level of awareness of the HACCP based approach is minimal and the level of training in it non-existent. In most cases retailers and caterers do not have the training or resources
to enable them to apply it to their operation. This is a fundamental weakness of the new system. It assumes a level of awareness and knowledge greater than that which actually exists and ignores the reality of the practical situation.

Given the deeply entrenched attitudes which form a barrier to its introduction it is unlikely that this approach will be successful unless extensive efforts are made to provide adequate training, and raise awareness of the system and its benefits. Without these the approach will fail.

13.6 TRAINING

Both retailing and catering sectors, particularly catering, have a high turnover of staff which makes training costly, difficult to administer and difficult to embed in the organisation. A Government compliance cost assessment for training in 1994 assumed a typical staff turnover rate of 30% and conservatively estimated an initial cost of between £27 Million and £31 Million, with a continuing annual recurring cost of between £24 Million and £28 Million (DOH 1994).

Nevertheless, training is perceived to be a desirable and cost effective way of improving hygienic food practices. Richmond (1990) considered that "all staff should receive training in food hygiene as part of their job".
Kitcher (1994) compared routines of staff who had been trained with those who had not in relation to temperature control, cleaning schedules, personal hygiene and the handling of food. He considered that training staff increased the hygienic handling of food and all aspects of process control. Whilst training may have contributed, such a finding may also reflect the culture within the organisation. Where an organisation provides a high level of training it is also likely to have strong management systems and be positive in promoting good practice. This may have had as much if not greater influence in affecting good practices.

The results of the study described in Chapters 9 and 10 indicate that retailers and caterers also consider that training is important. Some 84.8% of retailers and 93.6% of caterers thought it to be important to the safe operation of their business.

When an enabling provision was included in the Act and reference was made to the possible introduction of compulsory training of food handlers a surge in training occurred. As draft proposals were withdrawn the level of training declined (Kitcher 1994).

The training requirement incorporated in forthcoming hygiene regulations (HMSO 1995) requires "the proprietor of a food business to ensure that food handlers engaged in the food business are supervised and instructed and/or trained in food hygiene matters commensurate with their work activity".
This requirement is non-specific and, therefore, open to differing interpretation. It applies only to food handlers, and does not specifically require training for management and supervisory staff who nevertheless are crucial in ensuring good food safety standards and who would have an important role in implementing HACCP systems.

A more detailed interpretation is, however, given in the draft catering industry guide (JHIC 1995). This defines a food handler as "any person involved in a food business who, by his actions, or management, or decisions or advice, can directly influence the hygiene of any food handled by that business at any stage. This would encompass anyone who handles and prepares open food and the next line of supervision above. It also includes staff handling or cleaning articles or equipment with which food comes into contact". The guide also recommends that higher tiers of management who can have indirect influence should, as a matter of good practice, have recognition of food safety issues when making commercial decisions. Although only a draft proposal, this interpretation is to be welcomed in that for the first time, it gives clear guidance on the extent to which baseline training is needed.

The draft guide proposes three grades of hygiene training needed in order to meet the legal requirement. These are "the essentials of food hygiene", "hygiene awareness instruction" and "formal food hygiene training". Five categories of staff (A-E) are then identified, the level of training recommended dependent on the category. Within the formal food hygiene training grade are three levels of training. Level 1 involves a course of 6 hours duration, level 2 between 12 and 24
hours, and level 3 between 24 and 40 hours. The IEHO (now CIEH) food hygiene courses are listed as recognised courses.

On the basis of these proposals, food handlers preparing and handling high risk foods, would need to be trained to level 1, which is equivalent to the standard of the IEHO basic food hygiene course. Staff who manage or supervise any operation involving the preparation or serving of high risk foods would also need to be trained to this level and the guide recommends it to be good practice for this group to be trained to levels 2 and 3 as career and management responsibilities progress.

In effect, the proposed "core" training for most food handlers and supervisors is a course of 6 hours duration or equivalent. For those without vocational training, this equates to the level of training provided by the IEHO basic food hygiene course. The format and content of this course is similar to other courses provided by the RSH, SOFHT, and RIPHH.

In Chapter 11, a small scale study to assess the effectiveness of the IEHO basic food hygiene course on candidates awareness of the causes of food poisoning was described. Given the proposed new training requirement and that the course is equivalent to that proposed as baseline training for staff handling high risk food, the effectiveness of this type of training will be an important factor in the success of the training requirement.
In this case study, general awareness of a variety of food safety factors increased as a result of the course. If translated into practice this would result in an improvement in general food safety standards. However, relative awareness of inadequate temperature control as a major cause of food poisoning significantly reduced. Given that this is the major factor implicated in outbreaks of food poisoning it is unlikely that candidates would make changes in their practices that would significantly help to prevent such outbreaks. The effectiveness of the course in preventing food poisoning is, therefore, unclear.

Against this background there is, therefore, a need for further investigation of the effectiveness of basic food hygiene training in order to identify whether the emphasis on particular elements of the course is correct, whether it is successful in raising awareness of food safety factors which lead not only to improvements in general standards but specifically to factors that will reduce the incidence of food poisoning.

Experiences in health education have indicated that it is incorrect to assume that there is always a straight transfer of knowledge from an expert to a food handler. Further, that when such a transfer does occur, the knowledge is often not translated into correct behaviour (WHO 1988*).

In this context, it is important that further studies should consider not just the effectiveness of the course in raising awareness but also
the extent to which this knowledge is then implemented in practice. This may require theoretical training to be supplemented with a practical assessment. Many incidents of food related illness are not solely the result of ignorance but due to the failure to apply knowledge. Unhygienic practices are often deep rooted in the culture of an organisation and, therefore, even when a food handler's beliefs are changed, practices are unlikely to be implemented if the culture remains unchanged.

Further study should therefore, incorporate assessments of food handlers in the work situation to assess the application of knowledge in practice and the relative influences of training and the culture of the organisation.

Whilst the new training requirement is a welcome contribution to raising standards, it is important to establish the most effective way in which it can be provided. In addition, there is a need to assess its relative benefit in comparison to one for the full application of HACCP and a greater level of training at supervisory level, which may be a more cost-effective approach.

13.7 CHANGES OF APPROACH IN THE FOOD SAFETY SYSTEM

Greater emphasis is being placed on self regulation. This is a positive step forward in that over many years responsibility has shifted disproportionately to enforcers. Is there, however, evidence to suggest that the policy will work? This system of self regulation,
risk management and the approach to enforcement is based on that introduced by the Health and Safety at Work etc Act 1974 (HMSO 1974). This Act was drafted as a self regulating statute and extensive guidance and advice written by industry groups and the Health and Safety Commission is set out in Codes of Practice and Circulars.

Although this system has operated since 1974, the number of accidents at work has consistently risen since the introduction of the Act. On this basis, experience suggests that there is little evidence that a similar approach to food safety in retail and catering will be any more successful in preventing food related illness.

Further, in attempting to reduce the regulatory burden on business it may for many actually increase since many key requirements are unclear and non specific. Small establishments without the wherewithal of larger organisations will be hardest hit. Certainly anecdotal evidence in practice suggests that smaller retailers and caterers do not want a relaxation of regulations; they simply want them to be clearer, more precise and, therefore, less open to different interpretation. A so called "level playing field".
13.8 REFERENCES


Kitcher, 1994.  *Case for food hygiene training*. Environmental Health, 102, 3, 139-140.

421


Sanger, D., 1994. We need rules we can all understand. Sandwich and Snack News, 23, 10-11.

CHAPTER 14  CONCLUSIONS AND RECOMMENDATIONS

The review, in Chapter 6, of the incidence of food related illness and its reporting indicates that :-

(1) The continuing increase in the level of food related illness in England and Wales is a matter for serious concern.

(2) There is a need for greater effort to be devoted to the identification of the source and cause of sporadic cases of food related illness in order to provide a basis for food safety activity.

The survey of retailers and caterers described in Chapters 9 and 10 indicates that :-

(3) There was a poor appreciation amongst retailers and caterers of both the causes of outbreaks of food poisoning and the potential risks associated with their businesses. Only a small proportion, 8.3% of retailers and 11.5% of caterers, considered the potential risk from their business to be high. Indeed, the majority, 75.3% of retailers and 70.3% of caterers, thought the potential risk to be low.

(4) The impact of the Act on retailers and caterers was not as great as has been suggested. Less than a quarter of retailers (23%) and less than half of caterers (40.3%) thought that the Act had had a
considerable or major impact on their business. This impact was greater on large than small establishments and was perceived as greater by managers than by business proprietors. This suggests that the Act has had a greater effect on work systems than in terms of financial expenditure.

(5) The enforcement framework set up by the Food Safety Act 1990 is effective.

(6) The current registration scheme is of limited effectiveness and there is clear support for a licensing scheme to be introduced as recommended by the Richmond report (Richmond 1990).

(7) The review of the legislative controls in Chapter 8, discussed further in Chapter 13, indicates that the inadequacies in food hygiene regulations have resulted in criticisms of the historical system of regulation and inspection. Many of these inadequacies have not been addressed within the Food Safety (General Food Hygiene) Regulations 1995 and these criticisms are likely to continue.

The study undertaken and described in Chapters 9 and 10, together with supplementary data obtained in the studies described in Chapters 11 and 12 indicate that:

(8) The level of formal staff training in both retail and catering establishments is low, the most popular formal course being the
IEHO basic food hygiene course.

(9) Formal basic food hygiene training was successful in raising awareness of a number of food safety factors. It was not successful in raising awareness of inadequate temperature control as the major cause of outbreaks of food poisoning. The overall benefit of the course is, therefore, unclear.

(10) There is a need for the HACCP type approach to be included more prominently within food hygiene training.

(11) There is a need for further study of basic food hygiene training in order to evaluate its effectiveness in raising awareness of food safety issues and whether knowledge imparted is then implemented in practice. In particular, whether there is a need for theoretical training to be supplemented within a practical situation, and whether practical assessments are required.

(12) There is a need to assess the influence that the culture of an organisation has in determining whether knowledge imparted by training is implemented. Further, to determine the relative benefit of training as compared to the full application of HACCP combined with a greater level of training at supervisory level.

(13) The requirement within forthcoming hygiene regulations for food businesses to adopt a "HACCP" approach is a welcome and positive improvement. The full application of HACCP within the
catering sector would be extremely onerous at the present time. The Assured Safe Catering approach is considered to be a practical scheme for both retailers and caterers to adopt. However, since it clearly is not a full application of HACCP methodology, its implementation needs to be regarded with caution. Care must be taken over monitoring such schemes, and their effects carefully evaluated, before it can be confidently accepted as an appropriate and safe system. It should, however, be regarded as a step towards the introduction of a requirement for the full application of HACCP.

(14) There is a lack of awareness of HACCP and a lack of commitment to its implementation, particularly amongst smaller establishments and the proprietors of food businesses. Unless far greater effort is made to promote awareness of the benefits of the approach and to provide suitable training its implementation and credibility will be seriously undermined and it is unlikely to be effective in practice.
BIBLIOGRAPHY


DHSS, 1989. Advice from the Chief Medical Officer; Listeriosis and Food. DHSS PL/CMO(89): 16 Feb.

DOH, 1992. Advice from the Chief Medical Officer; Definition of Food Poisoning. Letter PL/CMO(92)14: 21 September.


Fletcher-Cooke, G., 1992. *Food Safety after the 1990 Act*. Environmental Health, 100, 06, 146-150.


Kitcher, 1994. Case for food hygiene training. Environmental Health, 102, 03, 139-140.


PHLS, 1993. Outbreaks of gastroenteritis associated with SRSVs. PHLS Microbiological Digest, 10, 1.


Riordan, T., 1989. Virus gastroenteritis. PHLS Microbiology Digest, 6, 130.


Sanger, D., 1994. We need rules we can all understand. Sandwich and Snack News, 23, 10-11.


Stern, N.J., Hernandez, M.P., Blenkinship, L., Deibel, K.E., Dores, S.,
and Campylobacter coli in retail meats. Journal of Food Protection, 48,
595-599.

Tauxe, R.V., Wauters, G., Goossens, V., van Noyen, R., Vandepitte, J.,
infections in pork: the missing link. Lancet, 8542, 1129-1132.

Disease in the United States. Journal of Food Protection, 52, 8,
595-601.

Disease in Canada and Costs to Reduce Salmonellosis. Journal of Food
Protection, 52, 8, 586 - 594.

epidemiology. PHLS Microbiological Digest 10, 3, 129-132.

Education.

and Yersinia species in retail foods. Food Control, 4, 1, 34-40.


BEST COPY

AVAILABLE

Poor text in the original thesis.
Some text bound close to the spine.
Some images distorted
FOOD SAFETY ACT 1990

This Act has affected the entire food industry. It is the most important change in UK food legislation for 50 years...

Dear Retailer

In force since 1 January 1991, the Food Safety Act 1990 has had a particular impact on the retail food sector.

Guildford Borough Council and the University of Surrey are undertaking a joint survey to examine the effects of the Act on businesses like yours.

You are part of a sample that has been selected to represent the views of the retail food sector as a whole. Therefore the answers that you can provide to the enclosed questions are extremely important for our research.

We would like you to complete the enclosed questionnaire in as much detail as possible and return the form to us within 14 days using the pre-paid envelope provided. You can rest assured that any responses you make will be treated in the strictest confidence.

Thank you in advance for your kind co-operation in completing this survey - without your help our research would be considerably devalued.

Yours sincerely,

John Martin
Principal Environmental Health Officer
Guildford Borough

Michael Kipps
Department of Management Studies for
Hotel and Tourism Industries
University of Surrey
1. Please indicate the size of your establishment by ticking the appropriate box.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small</td>
<td>(1)</td>
</tr>
<tr>
<td>Small</td>
<td>(2)</td>
</tr>
<tr>
<td>Medium</td>
<td>(3)</td>
</tr>
<tr>
<td>Large</td>
<td>(4)</td>
</tr>
<tr>
<td>Very Large</td>
<td>(5)</td>
</tr>
</tbody>
</table>

2. Which of the following categories best describes your business? (Please tick one box only)

<table>
<thead>
<tr>
<th>TYPE OF BUSINESS</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Outlet - single independent</td>
<td>(1)</td>
</tr>
<tr>
<td>Retail Outlet - part of a local chain</td>
<td>(2)</td>
</tr>
<tr>
<td>Retail Outlet - part of an area chain</td>
<td>(3)</td>
</tr>
<tr>
<td>Retail Outlet - part of a national chain</td>
<td>(4)</td>
</tr>
<tr>
<td>Other - (please specify)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

3. Please indicate the types of products that you sell by ticking the relevant boxes (You should tick all those that apply)

<table>
<thead>
<tr>
<th>FOODSTUFF</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrapped Raw Vegetables</td>
<td></td>
</tr>
<tr>
<td>Unwrapped Raw Vegetables</td>
<td></td>
</tr>
<tr>
<td>Raw Meat Wrapped</td>
<td></td>
</tr>
<tr>
<td>Raw Meat Unwrapped</td>
<td></td>
</tr>
<tr>
<td>Cooked Meats Wrapped</td>
<td></td>
</tr>
<tr>
<td>Cooked Meats Unwrapped</td>
<td></td>
</tr>
<tr>
<td>Dried Goods Wrapped</td>
<td></td>
</tr>
<tr>
<td>Dried Goods Unwrapped</td>
<td></td>
</tr>
<tr>
<td>Soft Cheese Wrapped</td>
<td></td>
</tr>
<tr>
<td>Soft Cheese Unwrapped</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
</tr>
<tr>
<td>Sandwiches</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FOODSTUFF</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream Cakes</td>
<td>(3)</td>
</tr>
<tr>
<td>Ice Cream</td>
<td>(4)</td>
</tr>
<tr>
<td>Poultry Fresh</td>
<td>(5)</td>
</tr>
<tr>
<td>Poultry Frozen</td>
<td>(6)</td>
</tr>
<tr>
<td>Milk</td>
<td>(7)</td>
</tr>
<tr>
<td>Tinned Goods</td>
<td>(8)</td>
</tr>
<tr>
<td>Sausages Unwrapped</td>
<td>(9)</td>
</tr>
<tr>
<td>Ready to Eat Meals</td>
<td>(10)</td>
</tr>
<tr>
<td>Prepared Salads</td>
<td>(11)</td>
</tr>
<tr>
<td>Packet Cereals</td>
<td>(12)</td>
</tr>
<tr>
<td>Fish Raw</td>
<td>(13)</td>
</tr>
<tr>
<td>Fish Frozen</td>
<td>(14)</td>
</tr>
</tbody>
</table>
4. To what extent have the changes introduced by the Food Safety Act 1990 affected your business?

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Effect</td>
<td>(1)</td>
</tr>
<tr>
<td>Little Effect</td>
<td>(2)</td>
</tr>
<tr>
<td>Some Effect</td>
<td>(3)</td>
</tr>
<tr>
<td>Considerable Effect</td>
<td>(4)</td>
</tr>
<tr>
<td>Major Effect</td>
<td>(5)</td>
</tr>
</tbody>
</table>

5. Please indicate the scale of importance that the following have in the safe operation of your food business by ticking the appropriate box.

<table>
<thead>
<tr>
<th></th>
<th>Very Important (1)</th>
<th>Important (2)</th>
<th>Not Important (3)</th>
<th>Very Unimportant (4)</th>
<th>Irrelevant (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest Control/ Prevention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard Analysis Critical Control Point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premises Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing Facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Training in Hygiene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock Rotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. What potential risk of causing food poisoning do you consider your business to present?

<table>
<thead>
<tr>
<th>RISK</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Hazardous</td>
<td>(1)</td>
</tr>
<tr>
<td>Hazardous</td>
<td>(2)</td>
</tr>
<tr>
<td>Some Risk</td>
<td>(3)</td>
</tr>
<tr>
<td>Low Risk</td>
<td>(4)</td>
</tr>
<tr>
<td>No Risk</td>
<td>(5)</td>
</tr>
</tbody>
</table>
7. Please indicate which of the following systems you have for your business by ticking the appropriate box in each case.

<table>
<thead>
<tr>
<th>WORK SYSTEM</th>
<th>No System (1)</th>
<th>Written (2)</th>
<th>Not Written (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dealing with Consumer Complaints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning/Disinfection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest Prevention Programme</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Excluding that provided as a part of refrigeration equipment, what type of thermometer(s) do you have for monitoring food temperature?

<table>
<thead>
<tr>
<th>THERMOMETER TYPE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Liquid Crystal (LCD)</td>
<td></td>
</tr>
<tr>
<td>Glass Mercury/Alcohol</td>
<td></td>
</tr>
<tr>
<td>Electronic Digital</td>
<td></td>
</tr>
<tr>
<td>Refrigeration Unit Ring Dials</td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
</tr>
</tbody>
</table>

9. Do the thermometers you detailed in question 8 comply with the technical requirements of the Code of Practice?

<table>
<thead>
<tr>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't Know (1)</td>
</tr>
<tr>
<td>No (2)</td>
</tr>
<tr>
<td>Yes (3)</td>
</tr>
</tbody>
</table>

10. Please indicate how often you check the temperature of food in your refrigeration units

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not checked</td>
<td>(1)</td>
</tr>
<tr>
<td>Monthly</td>
<td>(2)</td>
</tr>
<tr>
<td>Fortnightly</td>
<td>(3)</td>
</tr>
<tr>
<td>Weekly</td>
<td>(4)</td>
</tr>
<tr>
<td>Daily</td>
<td>(5)</td>
</tr>
<tr>
<td>More than once daily</td>
<td>(6)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>(7)</td>
</tr>
</tbody>
</table>
11. Please indicate what in-house training your staff have received. (*If you have no
staff please answer in respect of yourself*). Please tick each item applicable.

<table>
<thead>
<tr>
<th>TRAINING RECEIVED</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>(52)</td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td>(53)</td>
</tr>
<tr>
<td>Pest Control</td>
<td>(54)</td>
</tr>
<tr>
<td>Cleaning/Disinfection Routines</td>
<td>(55)</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>(56)</td>
</tr>
<tr>
<td>Temperature Control</td>
<td>(57)</td>
</tr>
<tr>
<td>Hazard Analysis Critical Control Point (HACCP)</td>
<td>(58)</td>
</tr>
<tr>
<td>Stock Rotation</td>
<td>(59)</td>
</tr>
</tbody>
</table>

12. What formal qualifications in Food Safety do you or your staff have?

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree or equivalent</td>
<td>(60)</td>
</tr>
<tr>
<td>Royal Society of Health</td>
<td>(61)</td>
</tr>
<tr>
<td>RIPHH Certificate</td>
<td>(62)</td>
</tr>
<tr>
<td>RIPHH Diploma</td>
<td>(63)</td>
</tr>
<tr>
<td>City &amp; Guilds</td>
<td>(64)</td>
</tr>
<tr>
<td>IEHO Basic Food Hygiene Certificate</td>
<td>(65)</td>
</tr>
<tr>
<td>IEHO Intermediate Hygiene Certificate</td>
<td>(66)</td>
</tr>
<tr>
<td>IEHO Advanced Hygiene Certificate</td>
<td>(67)</td>
</tr>
</tbody>
</table>

13. Please rank in priority from 1 to 6 which of the following you think cause the
greatest number of cases of food poisoning in the UK. (*1 indicates the highest
number of cases caused and 6 the least.*)

<table>
<thead>
<tr>
<th>CAUSES OF FOOD POISONING</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate temperature control</td>
<td>(76)</td>
</tr>
<tr>
<td>Inadequate hygiene training</td>
<td>(77)</td>
</tr>
<tr>
<td>Cross contamination</td>
<td>(78)</td>
</tr>
<tr>
<td>Poor or inadequate personal hygiene</td>
<td>(79)</td>
</tr>
<tr>
<td>Inadequate cleaning/disinfection</td>
<td>(80)</td>
</tr>
<tr>
<td>Pest infestation</td>
<td>(81)</td>
</tr>
</tbody>
</table>
14. If your food business has been inspected for "Food Safety" since 1 January 1991, how did the EHO follow up his visit?

<table>
<thead>
<tr>
<th>HOW FOLLOWED UP</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbally</td>
<td>(1)</td>
</tr>
<tr>
<td>By Letter</td>
<td>(2)</td>
</tr>
<tr>
<td>By Improvement Notice(s)</td>
<td>(3)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>(4)</td>
</tr>
<tr>
<td>No Inspection</td>
<td>(5)</td>
</tr>
</tbody>
</table>

15. Compared to written advice on matters found to need attention, is the use of Improvement Notices effective in making you carry out the necessary remedial measures?

<table>
<thead>
<tr>
<th>EFFECTIVENESS OF IMPROVEMENT NOTICES</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Effective</td>
<td>(1)</td>
</tr>
<tr>
<td>Effective</td>
<td>(2)</td>
</tr>
<tr>
<td>Not Very Effective</td>
<td>(3)</td>
</tr>
<tr>
<td>No Effect</td>
<td>(4)</td>
</tr>
</tbody>
</table>

16. Which of the following activities do you carry out? (Tick all those that apply.)

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slice cooked meats</td>
<td>(84)</td>
</tr>
<tr>
<td>Cut raw meat</td>
<td>(85)</td>
</tr>
<tr>
<td>Slice bacon</td>
<td>(86)</td>
</tr>
<tr>
<td>Prepare sandwiches</td>
<td>(87)</td>
</tr>
<tr>
<td>Weigh unwrapped vegetables</td>
<td>(88)</td>
</tr>
<tr>
<td>Wash vegetables</td>
<td>(89)</td>
</tr>
<tr>
<td>Weigh unwrapped cereals</td>
<td>(90)</td>
</tr>
<tr>
<td>Cut soft cheese</td>
<td>(91)</td>
</tr>
<tr>
<td>Cut hard cheese</td>
<td>(92)</td>
</tr>
<tr>
<td>Cook any foods</td>
<td>(93)</td>
</tr>
</tbody>
</table>
17. Which of the following do you keep written records of? *(Tick all those that apply.)*

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food temperature measurements</td>
<td></td>
</tr>
<tr>
<td>Staff training records</td>
<td></td>
</tr>
<tr>
<td>Pest control records</td>
<td></td>
</tr>
<tr>
<td>Cleaning and disinfection records</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

18. Do you consider that a system licensing food premises would improve food safety and help to reduce the incidence of food poisoning?

<table>
<thead>
<tr>
<th></th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>(1)</td>
</tr>
<tr>
<td>No</td>
<td>(2)</td>
</tr>
<tr>
<td>Don't Know</td>
<td>(3)</td>
</tr>
</tbody>
</table>

19. How effective do you consider the following provisions contained in the Food Safety Act 1990 to be in preventing Food Poisoning? *(Tick one box for each provision.)*

<table>
<thead>
<tr>
<th>LEGAL PROVISION</th>
<th>Very Effective (1)</th>
<th>Effective (2)</th>
<th>Some Effect (3)</th>
<th>Not Effective (4)</th>
<th>Don't Know (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement Notices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency Prohibition Notices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prohibition Orders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Due Diligence Defence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. Please indicate your position within your company. *(Tick the box which best describes your position.)*

<table>
<thead>
<tr>
<th>POSITION WITHIN COMPANY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>(1)</td>
</tr>
<tr>
<td>Store Manager/Manageress</td>
<td>(2)</td>
</tr>
<tr>
<td>Department Manager/Manageress</td>
<td>(3)</td>
</tr>
<tr>
<td>Hygiene/Safety Officer</td>
<td>(4)</td>
</tr>
<tr>
<td>Other <em>(please specify)</em></td>
<td>(5)</td>
</tr>
</tbody>
</table>

Thank you for completing this questionnaire. Your assistance is greatly appreciated.
FOOD SAFETY ACT 1990

This Act has affected the entire food industry. It is the most important change in UK food legislation for 50 years...

Dear Caterer

In force since 1 January 1991, the Food Safety Act 1990 has had a particular impact on the catering sector.

Guildford Borough Council and the University of Surrey are undertaking a joint survey to examine the effects of the Act on businesses like yours.

You are part of a sample that has been selected to represent the views of the catering food sector as a whole. Therefore the answers that you can provide to the enclosed questions are extremely important for our research.

We would like you to complete the enclosed questionnaire in as much detail as possible and return the form to us within 14 days using the pre-paid envelope provided. You can rest assured that any responses you make will be treated in the strictest confidence.

Thank you in advance for your kind co-operation in completing this survey - without your help our research would be considerably devalued.

Yours sincerely,

John Martin
Principal Environmental Health Officer
Guildford Borough

Michael Kipps
Department of Management Studies for Hotel and Tourism Industries
University of Surrey
1. Please indicate the description which best describes your type of establishment by ticking the appropriate box.

<table>
<thead>
<tr>
<th>ESTABLISHMENT TYPE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Restaurant</td>
<td>(1)</td>
</tr>
<tr>
<td>Take Away</td>
<td>(2)</td>
</tr>
<tr>
<td>Hotel - less than 20 rooms</td>
<td>(3)</td>
</tr>
<tr>
<td>Hotel - 21 or more rooms</td>
<td>(4)</td>
</tr>
<tr>
<td>Mobile Catering Vehicle</td>
<td>(5)</td>
</tr>
<tr>
<td>Hospital/Institutional Catering</td>
<td>(6)</td>
</tr>
<tr>
<td>Industrial Catering</td>
<td>(7)</td>
</tr>
<tr>
<td>Educational Establishment</td>
<td>(8)</td>
</tr>
<tr>
<td>Other - <em>(please specify)</em></td>
<td>(9)</td>
</tr>
</tbody>
</table>

2. Please indicate the number of meals you prepare each day by ticking the appropriate box.

<table>
<thead>
<tr>
<th>NUMBER OF MEALS PREPARED PER DAY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20</td>
<td>(1)</td>
</tr>
<tr>
<td>Between 20 and 100</td>
<td>(2)</td>
</tr>
<tr>
<td>Between 101 and 500</td>
<td>(3)</td>
</tr>
<tr>
<td>Between 501 and 1,000</td>
<td>(4)</td>
</tr>
<tr>
<td>More than 1,000</td>
<td>(5)</td>
</tr>
</tbody>
</table>

3. Please indicate the type of catering/food preparation operation you carry out. *(You should tick all those that apply)*

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook Chill</td>
<td>(3)</td>
</tr>
<tr>
<td>Cook Freeze</td>
<td>(4)</td>
</tr>
<tr>
<td>Cook to Order</td>
<td>(5)</td>
</tr>
<tr>
<td>Reheat Pre-Cooked</td>
<td>(6)</td>
</tr>
<tr>
<td>Reheat from Frozen</td>
<td>(7)</td>
</tr>
<tr>
<td>Traditional Catering</td>
<td>(8)</td>
</tr>
<tr>
<td>Other <em>(please specify)</em></td>
<td>(9)</td>
</tr>
</tbody>
</table>
4. To what extent have the changes introduced by the Food Safety Act 1990 affected your business?

- No Effect
- Little Effect
- Some Effect
- Considerable Effect
- Major Effect

5. Please indicate the scale of importance that the following have in the safe operation of your food business by ticking the appropriate box.

- Temperature Control
- Pest Control/Prevention
- Personal Hygiene
- Hazard Analysis Critical Control Point
- Premises Structure
- Washing Facilities
- Quality Assurance
- Staff Training in Hygiene
- Stock Rotation

6. How would you describe the potential risk that there could be from the food preparation carried out by your business?

- Very Hazardous
- Hazardous
- Some Risk
- Low Risk
- No Risk
7. Please indicate which of the following systems you have for your business by ticking the appropriate box in each case.

<table>
<thead>
<tr>
<th>WORK SYSTEM</th>
<th>No System (1)</th>
<th>Written (2)</th>
<th>Not Written (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Monitoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dealing with Consumer Complaints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning/Disinfection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest Prevention Programme</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard Analysis (HACCP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Excluding that provided as a part of refrigeration equipment, what type of thermometer(s) do you have for monitoring food temperature?

<table>
<thead>
<tr>
<th>THERMOMETER TYPE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Liquid Crystal (LCD)</td>
<td></td>
</tr>
<tr>
<td>Glass Mercury/Alcohol</td>
<td></td>
</tr>
<tr>
<td>Electronic Digital</td>
<td></td>
</tr>
<tr>
<td>Refrigeration Unit Ring Dial</td>
<td></td>
</tr>
<tr>
<td>Other <em>(please specify)</em></td>
<td></td>
</tr>
</tbody>
</table>

9. Do the thermometers you detailed in question 8 comply with the technical requirements detailed within the Code of Practice?

<table>
<thead>
<tr>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don't Know (1)</td>
</tr>
<tr>
<td>No (2)</td>
</tr>
<tr>
<td>Yes (3)</td>
</tr>
</tbody>
</table>
10. Please indicate how often you check the temperature of food in your refrigeration units.

<table>
<thead>
<tr>
<th>FREQUENCY - REFRIGERATED UNITS</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not checked</td>
<td>(1)</td>
</tr>
<tr>
<td>Monthly</td>
<td>(2)</td>
</tr>
<tr>
<td>Fortnightly</td>
<td>(3)</td>
</tr>
<tr>
<td>Weekly</td>
<td>(4)</td>
</tr>
<tr>
<td>Daily</td>
<td>(5)</td>
</tr>
<tr>
<td>Twice daily</td>
<td>(6)</td>
</tr>
<tr>
<td>More than twice daily</td>
<td>(7)</td>
</tr>
<tr>
<td>Continuously</td>
<td>(8)</td>
</tr>
</tbody>
</table>

11. Please indicate how often you check the temperature of food in your hot display cabinets.

<table>
<thead>
<tr>
<th>FREQUENCY - HEATED UNITS</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not checked</td>
<td>(1)</td>
</tr>
<tr>
<td>Daily</td>
<td>(2)</td>
</tr>
<tr>
<td>Twice daily</td>
<td>(3)</td>
</tr>
<tr>
<td>More than twice daily</td>
<td>(4)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

12. Please indicate what proportion of your staff engaged in the handling of open food have achieved the following formal qualifications. (Please do not include waitressing or cleaning staff).

<table>
<thead>
<tr>
<th>QUALIFICATIONS</th>
<th>PERCENTAGE OF STAFF QUALIFIED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0% (1)</td>
</tr>
<tr>
<td>Degree or equivalent</td>
<td></td>
</tr>
<tr>
<td>Royal Society of Health</td>
<td></td>
</tr>
<tr>
<td>RIPHH Certificate</td>
<td></td>
</tr>
<tr>
<td>RIPHH Diploma</td>
<td></td>
</tr>
<tr>
<td>City and Guilds</td>
<td></td>
</tr>
<tr>
<td>IEHO Basic Food Hygiene Certificate</td>
<td></td>
</tr>
<tr>
<td>IEHO Intermediate Hygiene Certificate</td>
<td></td>
</tr>
<tr>
<td>IEHO Advanced Hygiene Certificate</td>
<td></td>
</tr>
</tbody>
</table>
13. Please rank in priority from 1 to 6 which of the following you think cause the greatest number of cases of food poisoning in the UK. (1 indicates the highest number of cases caused and 6 the least.)

<table>
<thead>
<tr>
<th>CAUSES OF FOOD POISONING</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate temperature control</td>
<td>(38)</td>
</tr>
<tr>
<td>Inadequate hygiene training</td>
<td>(39)</td>
</tr>
<tr>
<td>Cross contamination</td>
<td>(40)</td>
</tr>
<tr>
<td>Poor or inadequate personal hygiene</td>
<td>(41)</td>
</tr>
<tr>
<td>Inadequate cleaning/disinfection</td>
<td>(42)</td>
</tr>
<tr>
<td>Pest infestation</td>
<td>(43)</td>
</tr>
</tbody>
</table>

14. Which of the following do you keep written records of? (Tick all those that apply).

<table>
<thead>
<tr>
<th>ACTIVITY RECORDED</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Temperature Measurements</td>
<td>(52)</td>
</tr>
<tr>
<td>Staff Hygiene Training Records</td>
<td>(53)</td>
</tr>
<tr>
<td>Pest Control Records</td>
<td>(54)</td>
</tr>
<tr>
<td>Cleaning and Disinfection Records</td>
<td>(55)</td>
</tr>
<tr>
<td>Maintenance Records</td>
<td>(56)</td>
</tr>
<tr>
<td>HACCP Systems Data</td>
<td>(57)</td>
</tr>
</tbody>
</table>

15. How important do you consider HACCP Systems in preventing food poisoning from catering operations?

<table>
<thead>
<tr>
<th>IMPORTANCE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential</td>
<td>(1)</td>
</tr>
<tr>
<td>Very important</td>
<td>(2)</td>
</tr>
<tr>
<td>Important</td>
<td>(3)</td>
</tr>
<tr>
<td>Not very important</td>
<td>(4)</td>
</tr>
<tr>
<td>Not important</td>
<td>(5)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>(6)</td>
</tr>
</tbody>
</table>
16. How practical do you consider it to be to operate HACCP systems in your own catering operation?

<table>
<thead>
<tr>
<th>PRACTICALITY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very practical</td>
<td>(1)</td>
</tr>
<tr>
<td>Practical</td>
<td>(2)</td>
</tr>
<tr>
<td>Not very practical</td>
<td>(3)</td>
</tr>
<tr>
<td>Difficult</td>
<td>(4)</td>
</tr>
<tr>
<td>Very difficult</td>
<td>(5)</td>
</tr>
<tr>
<td>Don't know</td>
<td>(6)</td>
</tr>
</tbody>
</table>

17. Which of the following do your refrigerated storage facilities enable you to achieve? *(Tick one box only).*

<table>
<thead>
<tr>
<th>REFRIGERATED STORAGE FACILITIES</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store all raw and cooked/prepared food in separate units</td>
<td>(60)</td>
</tr>
<tr>
<td>Store most raw and cooked/prepared food in separate units</td>
<td>(61)</td>
</tr>
<tr>
<td>Store some raw and cooked/prepared food in separate units</td>
<td>(62)</td>
</tr>
<tr>
<td>Store raw and cooked food separately but in the same unit</td>
<td>(63)</td>
</tr>
<tr>
<td>Store raw and cooked foods in the same unit</td>
<td>(64)</td>
</tr>
</tbody>
</table>

18. Is the handling/preparation of the following foods carried out entirely in a separate area to cooked or prepared foods? *(Tick one box for each food).*

<table>
<thead>
<tr>
<th>HANDLING/PREPARATION IN A SEPARATE AREA</th>
<th>YES (1)</th>
<th>NO (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Meats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Eggs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. If your food business has been inspected for "Food Safety" since 1 January 1991, how did the EHO follow up his visit?

<table>
<thead>
<tr>
<th>HOW FOLLOWED UP</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbally</td>
<td>(1)</td>
</tr>
<tr>
<td>By Letter</td>
<td>(2)</td>
</tr>
<tr>
<td>By Improvement Notice(s)</td>
<td>(3)</td>
</tr>
<tr>
<td>Other <em>(please specify)</em></td>
<td>(4)</td>
</tr>
<tr>
<td>No Inspection</td>
<td>(5)</td>
</tr>
</tbody>
</table>
20. Is the use of Improvement Notices an effective way of making you carry out the necessary remedial measures? (Tick one box only).

<table>
<thead>
<tr>
<th>EFFECTIVENESS OF IMPROVEMENT NOTICES</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Effective</td>
<td>(1)</td>
</tr>
<tr>
<td>Effective</td>
<td>(2)</td>
</tr>
<tr>
<td>Not Very Effective</td>
<td>(3)</td>
</tr>
<tr>
<td>No Effect</td>
<td>(4)</td>
</tr>
</tbody>
</table>

21. Which of the following specifications/systems do you operate? (Please tick boxes that apply).

<table>
<thead>
<tr>
<th>SPECIFICATIONS/SYSTEMS</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of suppliers premises</td>
<td>(70)</td>
</tr>
<tr>
<td>Written quality specifications for food supplies</td>
<td>(71)</td>
</tr>
<tr>
<td>Temperature specification for food deliveries</td>
<td>(72)</td>
</tr>
<tr>
<td>Internal hygiene auditing</td>
<td>(73)</td>
</tr>
<tr>
<td>Microbiological auditing of your premises or food</td>
<td>(74)</td>
</tr>
<tr>
<td>Quality control systems</td>
<td>(75)</td>
</tr>
</tbody>
</table>

22. Please indicate your position within your company. (Tick the box which best describes your position).

<table>
<thead>
<tr>
<th>POSITION WITHIN COMPANY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>(1)</td>
</tr>
<tr>
<td>Manager/Manageress</td>
<td>(2)</td>
</tr>
<tr>
<td>Catering Manager/Manageress</td>
<td>(3)</td>
</tr>
<tr>
<td>Hygiene/Safety Officer</td>
<td>(4)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

Thankyou for completing this questionnaire. Your assistance is greatly appreciated.
EASIC FOOD HYGIENE COURSE QUESTIONNAIRE

1. Please indicate the description which best describes the type of establishment in which you work by ticking the appropriate box.

<table>
<thead>
<tr>
<th>ESTABLISHMENT TYPE</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Restaurant</td>
<td>(1)</td>
</tr>
<tr>
<td>Take Away</td>
<td>(2)</td>
</tr>
<tr>
<td>Hotel - less than 20 rooms</td>
<td>(3)</td>
</tr>
<tr>
<td>Hotel - 21 or more rooms</td>
<td>(4)</td>
</tr>
<tr>
<td>Mobile Catering Vehicle</td>
<td>(5)</td>
</tr>
<tr>
<td>Hospital/Institutional Catering</td>
<td>(6)</td>
</tr>
<tr>
<td>Industrial Catering</td>
<td>(7)</td>
</tr>
<tr>
<td>Educational Establishment</td>
<td>(8)</td>
</tr>
<tr>
<td>Other - (please specify)</td>
<td>(9)</td>
</tr>
</tbody>
</table>

2. Please indicate the number of meals prepared each day where you work by ticking the appropriate box.

<table>
<thead>
<tr>
<th>NUMBER OF MEALS PREPARED PER DAY</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20</td>
<td>(1)</td>
</tr>
<tr>
<td>Between 20 and 100</td>
<td>(2)</td>
</tr>
<tr>
<td>Between 101 and 500</td>
<td>(3)</td>
</tr>
<tr>
<td>Between 501 and 1,000</td>
<td>(4)</td>
</tr>
<tr>
<td>More than 1,000</td>
<td>(5)</td>
</tr>
</tbody>
</table>

3. Please rank in priority from 1 to 6 which of the following you think cause the greatest number of cases of food poisoning in the UK. (1 indicates the highest number of cases caused and 6 the least.)

<table>
<thead>
<tr>
<th>CAUSES OF FOOD POISONING</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate temperature control</td>
<td></td>
</tr>
<tr>
<td>Inadequate hygiene training</td>
<td></td>
</tr>
<tr>
<td>Cross contamination</td>
<td></td>
</tr>
<tr>
<td>Poor or inadequate personal hygiene</td>
<td></td>
</tr>
<tr>
<td>Inadequate cleaning/disinfection</td>
<td></td>
</tr>
<tr>
<td>Pest infestation</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C - Part B

4 Please rank in priority from 1 to 6 which of the following you think cause the greatest number of cases of food poisoning in the UK. (1 indicates the highest number of cases caused and 6 the least.)

<table>
<thead>
<tr>
<th>CAUSES OF FOOD POISONING</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate temperature control</td>
<td></td>
</tr>
<tr>
<td>Inadequate hygiene training</td>
<td></td>
</tr>
<tr>
<td>Cross contamination</td>
<td></td>
</tr>
<tr>
<td>Poor or inadequate personal hygiene</td>
<td></td>
</tr>
<tr>
<td>Inadequate cleaning/disinfection</td>
<td></td>
</tr>
<tr>
<td>Pest infestation</td>
<td></td>
</tr>
</tbody>
</table>

5 Why did you attend today's course? (Tick one box only).

<table>
<thead>
<tr>
<th>REASON FOR ATTENDING</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asked to by my employer</td>
<td></td>
</tr>
<tr>
<td>Need to because of my job</td>
<td></td>
</tr>
<tr>
<td>For Personal Interest</td>
<td></td>
</tr>
</tbody>
</table>

6 How useful do you think the content of the course will be?

<table>
<thead>
<tr>
<th>HOW BENEFICIAL?</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very useful</td>
<td></td>
</tr>
<tr>
<td>Useful</td>
<td></td>
</tr>
<tr>
<td>Some use</td>
<td></td>
</tr>
<tr>
<td>No use</td>
<td></td>
</tr>
</tbody>
</table>
7 What effect will what you have learnt have on the way you work?

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>TICK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot change</td>
<td></td>
</tr>
<tr>
<td>Some change</td>
<td></td>
</tr>
<tr>
<td>Little change</td>
<td></td>
</tr>
<tr>
<td>No change</td>
<td></td>
</tr>
</tbody>
</table>

8 Please give 3 ways in which the way you work will change

1
2
3

THANK YOU FOR YOUR HELP
APPENDIX D

HACCP AUDIT EVALUATION CHECKLIST

<table>
<thead>
<tr>
<th>PROCESS STAGE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PURCHASE</strong></td>
<td></td>
</tr>
<tr>
<td>Documented system</td>
<td></td>
</tr>
<tr>
<td>Quality specification</td>
<td></td>
</tr>
<tr>
<td>Nominated suppliers</td>
<td></td>
</tr>
<tr>
<td>Checking of suppliers</td>
<td></td>
</tr>
<tr>
<td><strong>RECEIPT OF FOOD</strong></td>
<td></td>
</tr>
<tr>
<td>Documented system</td>
<td></td>
</tr>
<tr>
<td>Frequency of delivery</td>
<td></td>
</tr>
<tr>
<td>Visual checks</td>
<td></td>
</tr>
<tr>
<td>Temperature checks</td>
<td></td>
</tr>
<tr>
<td>- What:</td>
<td></td>
</tr>
<tr>
<td>- When:</td>
<td></td>
</tr>
<tr>
<td>- Who:</td>
<td></td>
</tr>
<tr>
<td>Temperature limits and action</td>
<td></td>
</tr>
<tr>
<td>Cross contamination</td>
<td></td>
</tr>
<tr>
<td>Records</td>
<td>- Delivery:</td>
</tr>
<tr>
<td></td>
<td>- Visual:</td>
</tr>
<tr>
<td></td>
<td>- Temperature:</td>
</tr>
</tbody>
</table>
STORAGE

Documented system
Temperature checks
- What
- When:
- Who:
Temperature limits and action
Temperature records
Separation raw and cooked
Date coding/stock rotation

PREPARATION

Temperature control
Cross contamination
Hygiene of equipment

COOKING

Time x Temperature standards
Time x Temperature checks
Records
Temperature limits and action

COOLING

Documented system
Time x Temperature standards
Time x Temperature checks
Records
HOT HOLDING

Documented system
Time x Temperature standards
Time x Temperature checks
Records

REHEATING

Documented system
Time x Temperature standards
Time x Temperature checks
Records

CHILLED STORAGE

Time x Temperature
Date coding
Cross contamination

SERVICE

Time x Temperature
Cross contamination

TEMPERATURE MONITORING

Training
Equipment
Frequency Hot:
Cold:
Fridges:
Freezers:
Records
Monitoring

TRAINING
Management
Food handlers
Policy
Refresher
Records

CLEANING
Procedures
Monitoring
Records

HYGIENE
Responsibilities defined
Written policy

PEST CONTROL
Procedures
Records
Monitoring

ADDITIONAL COMMENTS
Dear Sir/Madam

RE: FOOD SAFETY ACT 1990

I am writing to seek your assistance in a Joint Research Study between Guildford Borough Council and the University of Surrey to examine the effects of the Food Safety Act 1990 on food safety in retailing and catering with England and Wales. We will be sending Questionnaires to these two sectors of the food trade and it is intended that the results be made available through published articles in journals.

The Institution of Environmental Health Officers is aware of the project which will study the practical effects that the Act has had. This will provide important information for the profession.

Your help with our research would be greatly appreciated. In particular we need to identify Caterers and Retailers to whom Questionnaires can be sent. I would ask you, therefore, to provide names and addresses of both Caterers and Retailers within your area to which Questionnaires could be sent. It would be extremely helpful if these were in the form of printed labels. The labels may be returned using the following FREEPOST address:

Guildford Borough Council
Housing & Health Department (JRM)
FREEPOST (G164)
Guildford
GU2 5BR

For the purpose of the study, caterers includes restaurants, cafes, takeaways, canteens, hospital and workplace kitchens. Retailers include wholesale and retail grocers, supermarkets, health food shops and similar outlets.

This research would of course be impossible without your assistance and I would like to thank you in advance for your kind co-operation in helping with this important study.

Yours faithfully

J Martin
PRINCIPAL ENVIRONMENTAL HEALTH OFFICER