

Management of outbreaks of foodborne illness in England and Wales

MANAGEMENT OF OUTBREAKS OF FOODBORNE ILLNESS IN ENGLAND AND WALES

Acknowledgements

This guidance updates that published in December 1994 by the Department of Health and we would like to acknowledge our debt to the Working Group responsible for putting together that guidance.

Thanks also go to Stephen Pugh who produced a first draft of this guidance, and to John Curnow and Jenny Morris, who acted as an editorial team.

Grateful thanks also go to all those who offered written and oral comments and advice, both within the Food Standards Agency and from other organisations, and particularly to those who participated in the workshop at which the work of revising the guidance started.

Further copies may be obtained from:

Food Standards Agency
Aviation House
125 Kingsway
London WC2B 6NH
Tel: 020 7276 8370
Fax: 020 7276 8376

Contents

Chapter	Page
Abbreviations	3
1. Introduction	4
2. Roles and Responsibilities	6
Introduction	6
Local Authorities	7
Health Protection Agency	7
Food Standards Agency	9
Departments of Health	10
Veterinary Laboratories Agency	10
3. Outbreak control arrangements	11
Outbreak Control Plans	11
The Outbreak Control Team	12
Membership of the Outbreak Control Team	13
Role and Terms of Reference of the Outbreak Control Team	15
4. Identification of outbreaks	17
5. Investigation and control of an outbreak	19
Overview	19
Introduction	23
Preliminary Phase	24
Communications	30
Descriptive Epidemiology	33
Analysis and Interpretation	35
Control Measures	38
Final Phase	41

6. – Microbiological sampling and analysis 43

7. – The Food Alert System 49

Appendices

I. Features of foodborne illness 52

II. Initial assessment of an outbreak 63

III. Cohort and case control studies 64

IV. Check list for product recalls 67

V. A template for an Outbreak Control Team Report 71

VI. Glossary 73

Abbreviations

CCDC	Consultant in Communicable Disease Control
CDSC	Communicable Disease Surveillance Centre (Wales)
CEHO	Chief Environmental Health Officer
Cfi	Centre for Infections
CMO	Chief Medical Officer
Defra	Department for Environment, Farming and Rural Affairs
DH	Department of Health
EHD	Environmental Health Department
EHO	Environmental Health Officer
EHP	Environmental Health Practitioner
ETEC	Enterotoxigenic <i>Escherichia coli</i>
FBO	Food Business Operator
FSA	Food Standards Agency
GEZI	Department of Gastrointestinal and Emerging Zoonotic Infections
HPA	Health Protection Agency
HPT	Health Protection Trust (Wales)
HPU	Health Protection Unit (England)
LA	Local Authority
LARS	Local and Regional Services Directorate
LHB	Local Health Board (Wales)
NPHS	National Public Health Service (Wales)
OCT	Outbreak Control Team
PACE	Police and Criminal Evidence Act 1984
PCT	Primary Care Trust (England)
PFGE	Pulsed Field Gel Electrophoresis
RDPH	Regional Director of Public Health
RHA	Regional Health Authority
RMN	Regional Microbiology Network
VIO	Veterinary Investigation Officer
VLA	Veterinary Laboratories Agency
VT	Verocytotoxin
VTEC	Verocytotoxin-producing <i>Escherichia coli</i>

1. Introduction

1.1. The purpose of this document is to provide a framework for health professionals to assist them in the management of outbreaks of infectious intestinal disease caused by ingestion of microbiologically contaminated food. It is designed to assist the Outbreak Control Team (OCT) in dealing with an outbreak and provides an aide-memoire for medical and nursing staff, environmental health professionals, scientists and others involved in the investigation.

1.2. This document updates “Management of Outbreaks of Foodborne Illness” (DH 1994), reflecting the changes in roles and responsibilities of public bodies in 2008 following key reorganisations since 1994. These include the creation of the Food Standards Agency (FSA) 2000, the Health Protection Agency (HPA) 2004, Defra 2004 and the 2008 configurations of Primary Care Trusts and SHAs.

1.3. This is a summary guidance document for everyday use by investigators and is not designed to be an in depth resource, for which standard texts on microbiology, epidemiology and public health should be consulted. The benefit of this document is that it is small enough to fit into a brief case and it is hoped that the guidance herein will be adopted as a ready source of information for everyday use by investigating staff.

1.4. The guide reflects current legislation for health protection against foodborne hazards and statutory Codes of Practice but it is not a statement of the law. In cases where contraventions of the law are identified, the risk they pose to public health should be considered and

enforcement action commensurate to the risk taken. The requirements of the Police and Criminal Evidence Act 1984 with regard to the interviewing of persons suspected of having committed an offence must also be met. However, from the perspective of this guide a successful outcome is the cessation of the outbreak, identification of what went wrong and the measures needed to prevent a recurrence.

1.5. Food poisoning is defined under the Food Safety Act as "any disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water". In practice, outbreaks associated with the consumption of water from public and private drinking water supplies are considered under separate guidance and are not covered in this document, nor does it cover outbreaks due to direct contact with animals or environments contaminated by animal faeces. The document covers toxins produced by micro-organisms, but excludes all other categories of ingested chemical or radioactive poisons.

2. Roles and responsibilities

Introduction

2.1. The objectives in controlling an outbreak are:

1. To reduce to the minimum the number of primary cases of illness. This involves the prompt recognition of the outbreak and identification and control of the source of the infection or contamination.
2. To reduce to the minimum the number of secondary cases of infection, by identifying cases and taking appropriate action to prevent any subsequent spread.
3. To prevent further episodes of illness by identifying continuing hazards and eliminating or minimising the risk they pose.

2.2. The situation may be complicated by the fact that for some diseases the method of transmission may change during the course of the incident. The role of person to person spread and the possibility of contamination of food during preparation from the environment must always be considered.

2.3. Statutory responsibilities for controlling outbreaks rest with the Proper Officer of the Local Authority (LA), in practice this is the Consultant in Communicable Disease Control (CCDC). A number of organisations will usually be involved in investigating and controlling the outbreak as members of the Outbreak Control Team (OCT) or as national organisations with responsibility for disease control. The roles and responsibilities of these key players are outlined in the following paragraphs, which also reflect differences in the arrangements in England and in Wales.

Local Authorities

2.4. Local authorities and port health authorities play a key role in managing outbreaks of foodborne illness. The Food Safety Act (1990) and the Food Hygiene Regulations (2006), or their equivalent in devolved administrations, place responsibilities and powers of control with local authorities. The investigation of outbreaks of foodborne disease is carried out by Environmental Health Professionals (EHPs) and others employed by the local authority. Local authorities have powers to assist both investigation and control of outbreaks, including powers of entry, sampling powers and powers to exclude food handlers, seize and detain food and close premises.

Primary Care Trusts (PCTs)

2.5. PCTs have a statutory right duty to protect the health of the population and Directors of Public Health are the individuals in PCTs who take the lead public health role for the organisation during outbreaks. PCTs are also the gateway to influence primary care resources that may be needed during the management of an outbreak. Collaborative arrangements exist between PCTs and local authorities as defined in HSG (93)56 *Public Health: responsibilities of the NHS and the roles of others*. In Wales, these functions are carried out by The Local Health Board.

Health Protection Agency and National Public Health Service

2.6. The HPA was created in 2002 and subsumed most of the communicable disease surveillance and investigation roles of the then Health Authorities as well as those of the Public Health Laboratory Service in England. The management of outbreaks of foodborne disease involves the HPA's Local and Regional Services Division (LARS), Regional

Microbiology Network (RMN) and the Centre for Infections (Cfi), which includes both epidemiological and reference laboratory services.

2.7. **Local Health Protection Units (HPUs)** investigate and manage outbreaks of communicable disease, provide surveillance of communicable diseases and infections and support local authorities (including port health authorities) in their responsibilities under the Public Health (Control of Disease) Act 1984 and associated regulations. Local HPUs are staffed by CCDCs, nurses and other staff with specialist health protection skills and have access to expert advice on health emergency planning and communications.

2.8. **The HPA**, usually through regional epidemiology units, coordinates the surveillance of communicable diseases at regional level. The HPA Regional Director, or his/her representatives, may also coordinate the work of HPUs in providing the input of the HPA to major incidents which cross two or more HPUs in the region.

2.9. The **Regional Microbiology Network** has Regional Microbiologists, who manage or commission regional public health microbiology services (including food, water and environmental microbiology), and Collaborating Consultant Microbiologists, who are based in NHS laboratories but have a special interest in health protection. The HPA's regional laboratories undertake specialist tests and provide support for NHS microbiology laboratories.

2.10. In Wales, the **National Public Health Service (NPHS)** provides a similar range of functions.

2.11. The HPA's **Centre for Infections** (HPA CfI) is responsible for the collection and collation of data on outbreaks of communicable disease including foodborne illness and is involved in its prevention and control at a national level in England. The National Public Health Service (NPHS) provides the same services in Wales. Where appropriate, HPA CfI or NPHS can provide experts to assist in local outbreak investigations or, in the case of outbreaks with a national distribution, its experts may themselves design and carry out outbreak investigations.

2.12. **HPA reference laboratories** assist in the identification and investigation of outbreaks by subtyping isolates.

Food Standards Agency

2.13. The Food Standards Agency (FSA) is a UK-wide non-ministerial Government department, established under the Food Standards Act 1999 with responsibility for the protection of public health in relation to food. This guidance is issued under section 20 of the Act, which confers powers to issue guidance upon the FSA.

2.14. Local authorities have a responsibility under Codes of Practice¹ to inform FSA of all national or serious localised outbreaks. The FSA Incidents Branch is the point of contact for LAs in relation to outbreaks and incidents. The FSA will normally participate in national Outbreak Control Teams (OCTs) and will assist in the investigation of implicated foods.

2.15. Where investigations implicate a food distributed in the UK, the FSA will carry out a risk assessment and work with LAs to advise the

¹ Food Law Code of Practice 2006 section 1.7.6

food business operator (FBO) on steps that ought to be taken in relation to the affected product(s). Those steps may include the withdrawal or recall of food pursuant to EC Regulation 178/2002.

2.16. The FSA is the national contact point for the European Commission's Rapid Alert System for Food and Feed (RASFF) and will use the system to inform the EU and member states if foods implicated in outbreaks of foodborne disease have been distributed outside the UK. This system is also used to inform the Commission and originating third countries of serious incidents or outbreaks caused by a food whose origin is beyond the UK's national borders.

Departments of Health

2.17. The Departments of Health for England and for the Welsh Assembly Government have a role in setting strategy and policy for the prevention, treatment and control of infectious diseases. The Public Health (Infectious Diseases) Regulations 1988 place a duty on LA professionals to inform the Chief Medical Officers (CMOs) of all serious outbreaks of communicable disease.

2.18. In April 2000, all central government responsibilities in relation to foodborne disease were transferred to the FSA. LA professionals should therefore inform the Agency of serious outbreaks of foodborne disease.

2.19. See section 5.17 for advice relating to the management of outbreaks in hospitals and other healthcare settings.

Veterinary Laboratories Agency

2.20. The Veterinary Laboratories Agency is funded by Defra to give assistance to outbreak control teams as appropriate where a direct or indirect animal source is implicated in outbreaks of enteric (or other zoonotic) illness and where veterinary investigation (including collection of appropriate animal samples) or intervention could help reduce risks to the public. Veterinary involvement may be initiated centrally by Defra or locally following contact between the CCDC or the LA and the local VLA regional laboratory.

3. Outbreak control arrangements

Outbreak Control Plans

3.1. Co-ordinated outbreak control plans should have already been drawn up by LAs, HPUs, Primary Care Trusts (PCTs), and local microbiological services, working closely with the local CCDC. Other agencies such as the Port Health Authority will also have an important input. Plans should be clear, succinct and practical and be generic in nature. They should include, as applicable:

1. A description of the roles and responsibilities of each contributing organisation and individuals.
2. A robust method of mobilising the plan including the arrangements by which the Outbreak Control Team (OCT) is activated and supported.

3. A clear statement as to the leadership of the OCT.
4. A comprehensive system of communications including arrangements for liaison with neighbouring LAs and Health Protection Units, and with local health boards and NPHS in Wales, as well as the ability to consult with national bodies as appropriate.
5. Arrangements for linking to other emergency plans including the Major Incident Plan.
6. A clear arrangement for media liaison with the naming of a lead agency and a nominated spokesperson as required.
7. Arrangements for the care of patients including robust efforts to reduce secondary person to person spread.
8. Arrangements for the provision of the necessary equipment and facilities to enable the team to function adequately.
9. The provision of staff and facilities out of routine working hours.
10. A clear statement of the purpose of such a plan in the control of food related incidents.

3.2. Outbreak Control Plans should be reviewed and exercised regularly by all the relevant agencies. Joint exercises should be planned at regular intervals specified in the plan.

The Outbreak Control Team (OCT)

3.3. Outbreak Control Teams range in size and complexity from a small number of individuals engaging in a short telephone communication at a local level to a formal National OCT where the situation is both serious and widespread. The principles however remain much the same

whatever the position or size of the team. They are a multi-disciplinary team set up to investigate an outbreak, decide upon and apply control measures, and to ensure arrangements are in place for the care of the patients.

3.4. OCTs are generally convened by the CCDC to formally consider an outbreak when one or more of the following are present:

1. The disease poses an immediate and real health hazard to the population.
2. There are a large number of cases.
3. Cases occur unexpectedly in a widely distributed manner involving more than one local authority.
4. The disease is unusual and the epidemiology unclear.
5. When the CCDC feels the situation requires such an action.

Membership

3.5. The membership of the Outbreak Control Team will vary according to the circumstances. For efficient working it should include the essential key individuals but membership should be **kept to a minimum**. The following would normally expect to be included:

1. Consultant in Communicable Disease Control (CCDC)
2. The appropriate Environmental Health Officer
3. Consultant Microbiologist
4. Secretarial support

3.6. Depending on the size and nature of the incident the following additional members may be invited to attend:

1. The Director of Infection Prevention and Control in an NHS Trust
2. The Infection Control Nurse
3. Press Officer (from one of the core members of the OCT)
4. Food Standards Agency representative
5. Meat Hygiene Service representative
6. Veterinary representative from the VLA (usually a Veterinary Investigation Officer from the local VLA regional laboratory)
7. Consultant in Infectious Diseases
8. General Practitioner representative
9. Occupational Health Physician/Nurse
10. Toxicologist/Virologist
11. Food Examiner/Microbiologist.
12. Director of Public Health
13. Health and Safety Executive representative
14. Port Health Officer
15. Regional representation
16. Centre for Infection/CDSC Wales representation
17. Representatives from other Authorities/Agencies as necessary

3.7. For outbreaks involving hospitals and care facilities the OCT may wish to invite a representative from the infection control staff or a management representative from the establishment concerned. Detailed guidance for outbreaks in hospitals can be found elsewhere.

3.8. Where the manufacturer of a suspect food is large enough to have technical experts or where an industry body has such technical expertise, consideration should be given to the merits of inviting them to meetings of the team. This may be very helpful to the investigation and in developing strategies for prevention of further spread or prevention of future incidents. However, it is generally not appropriate for them to be members of the OCT.

Role and terms of reference

3.9. The role of the OCT is:

To agree and coordinate the activities of the agencies involved in the control and investigation of the outbreak in order to understand the aetiology, mechanism and source of the outbreak and to employ control measures to bring the incident to a speedy resolution.

3.10. The terms of reference naturally reflect the team's purpose and should be agreed upon in advance and contained within the outbreak control plan. A suitable example might be as follows:

1. A review of the evidence to establish the nature of the incident.
2. To develop a strategy to deal with the outbreak and allocate responsibilities for initiating action.

3. To agree on the parameters of the investigation such as case definition, methods of case finding and the process by which patients are interviewed and establishments inspected.
4. To agree the use of the microbiological and scientific facilities and to ensure that samples are clearly identifiable and properly handled in the interest of speedily identifying the nature, vehicle and source of the outbreak.
5. To prevent further cases by taking all necessary practical steps to ensure that the source of the outbreak is controlled and the cause dealt with.
6. To prevent further cases of a secondary nature by monitoring contacts and applying restrictions as appropriate.
7. To restrict the spread of the disease by communicating with other Local Authorities and Health Protection Units.
8. To provide an accurate and informative source of information for other professionals, the media and the public, and for national bodies such as the FSA and HPA.
9. To develop systems and procedures to prevent a future occurrence of similar incidents.
10. To produce a report or reports at least one of which will be the final report placed within the public domain.

4. Identification of outbreaks

4.1. Outbreaks may be identified in a number of ways and it is crucial to establish without delay whether or not the incident is real or anomalous.

An outbreak of foodborne illness is defined as either two or more linked cases of the same disease, or when the observed numbers of cases unaccountably exceeds the expected number.

4.2. Clearly we have to be sure that the cases in question are as a result of the same disease. A **case definition** is necessary to achieve this and such a definition needs to be carefully considered. Cases may come to light because of clinical symptoms reported to a health professional, microbiological analysis of specimens, or from specific complaints from the general public about a perceived incident. In considering a suitable case definition it must be remembered that, for some diseases symptomless excretion is commonplace (e.g. *E.coli* O157) and that such excretion is not a normal finding. Whether or not symptomless excretors are included in the case definition is a matter of choice but it is worth remembering that these individuals may be able to contribute to the epidemiological picture and they are themselves a source of ongoing infection by person to person spread.

4.3. Effective surveillance together with the systematic collection, collation, analysis and dissemination of information, remain the corner stone of outbreak identification. Common links in terms of time, person and place are the identifying features. Microbiological reporting also

plays an important role in identifying cases due to the same species of bacteria (e.g. *Salmonella* species) and may serve to alert the existence of linked cases. Such data may be subject to idiosyncrasies in the reporting chain. An apparent cluster of cases may be the result of specimen batching or some other administrative process for instance.

4.4. Reports from the general public may sometimes be misleading. They often contain an expectation of some form of compensation and so cannot be viewed as impartial information.

4.5. Where a disease is comparatively rare it might need additional data from a Regional (or even National) database to pick up an increase in the expected rate or some common factor linking cases. A system of good communication and reporting is essential. For this reason, local agencies should report significant outbreaks to HPA CfI or CDSC Wales immediately, by telephone, fax or email. 'Significant' is difficult to define in terms of size or severity but all general outbreaks should be reported, as should family outbreaks of the more serious infections and even single cases of those posing the greatest public health risk, (e.g. botulism). This is because national surveillance centres may be able to link a number of apparently unimportant outbreaks from different parts of the country to identify a much larger problem.

4.6. An initial report prompts HPA CfI to send a summary report form to the lead investigator to be completed and returned to HPA CfI at the end of the investigation. If a full investigation report has been prepared locally, a copy should also be sent with the summary report form.

5. The investigation and control of an outbreak

Overview

5.1. Whilst the approach to the investigation and control of an outbreak is likely to vary dependent on the circumstances, the following “aide memoire” is designed to assist in systematically addressing the issues. It is not intended to imply that each action must automatically follow the one preceding it, or that all steps are needed on every occasion. In practice some steps will be carried out simultaneously whilst others, for example, communication and collation of data, will be required throughout the whole process. Effective investigation and control will require good partnership working to bring together different areas of expertise. It is expected that the steps outlined below will involve input from the experts in relevant fields e.g. CCDC, environmental health staff, HPA/CDSC Wales epidemiologists, microbiologists and virologists.

Aide Memoire

Preliminary Phase

- Collate and assess the available information and consider whether or not the cases exhibit common symptoms and appear to share common exposure factors e.g. consumption of a particular food, attendance at a specific event, visit to a particular premises, direct or indirect contact with animals (on a particular public amenity premises for example) etc.
- Establish a tentative diagnosis.
- Agree case definition.
- Collect relevant specimens.
- Conduct in-depth interviews with initial cases to establish any common factors.
- Conduct on site investigations at implicated premises.
- Form preliminary hypothesis.
- Consider the likelihood of a continuing public health risk.
- Initiate immediate control measures proportionate to the public health risk.
- Identify the need to convene a formal Outbreak Control Team and the activation of the outbreak control plan.
- In the case of significant outbreaks (see para 4.5) inform the HPA CfI / CDSC Wales and the FSA Incidents Branch.
- Review the information gathered, assess the need for further investigation and identify the roles and responsibilities of the relevant partners.

Communication

- Agree who will have lead media responsibility.
- Identify all parties that need to receive outbreak information e.g. those dealing with the incident, wider support services, national and regional agencies, those affected by the outbreak, the local community as well as the outside world.
- Identify the most effective routes of communication with all those involved.
- Ensure accuracy and timeliness of communication, while also complying with relevant legislation e.g. Data Protection Act etc.
- Use the media constructively.
- Ensure relevant material is collected to inform a final written report for local and, where appropriate, wider distribution.

Descriptive epidemiology

- Draw up lists of those at risk.
- Identify persons posing a risk of further spread.
- Establish a case definition.
- Identify as many cases as possible.
- Collect data from affected persons on standardised questionnaires.

Analysis and interpretation

- Calculate attack rates.
- Confirm factors common to all or most cases.
- Categorise by “time, place or person” associations.
- Construct epidemic curve.
- Review all existing data.
- Review preliminary hypotheses and consider whether further epidemiological or microbiological investigations are required.
- Collect any necessary further clinical and food specimens for laboratory tests.
- Conduct further analytical epidemiological studies (case control or cohort studies).
- Conduct further microbiological studies (e.g. typing).
- Ascertain source and mode of spread.

Control measures

- Control the source (animal, human or environmental).
- Control the mode of spread.
- Protect persons at risk.
- Monitor effectiveness of control measures / maintain disease surveillance.

Final phase

- Identify the end of the outbreak (usually when the number of new cases has returned to background levels).
- Produce outbreak report.

Introduction

5.2. The focus of this guide is on outbreaks of foodborne illness that are microbiological in origin, however chemical or radiological contamination might also be the cause. The symptoms of these types of poisoning can be similar and at times it may be difficult to differentiate clinically between them. Even laboratory tests may not determine the cause. It should be remembered that long term exposure to a chemical in the diet can eventually present with what appears to be an acute episode of poisoning.

5.3. The general principles of an investigation will apply to microbiological, acute chemical or radiological foodborne incidents, although in chemical incidents person to person spread is unlikely to be an issue. The majority of outbreaks are microbiological, but, because it is not always clear at the beginning of an investigation whether the incident is microbiological, chemical or radiological in nature, it is important that at an early stage appropriate clinical samples from the cases are submitted to the laboratory (see section 6).

5.4. Many outbreaks are already over by the time they are discovered. If it becomes clear that there is no continuing public health risk a decision will have to be made, in the light of available resources and priorities, as to whether or not a full investigation is justified. Without further enquiry, it is likely to be impossible to come to firm conclusions about the source of the contamination and the vehicle or mode of spread. For example, just because a number of affected people ate fish it cannot be concluded that contaminated fish was responsible for the outbreak, no matter how biologically plausible; enquiry among unaffected people may reveal that they ate fish also. The discovery of

a breakdown in food hygiene may be suggestive, but further evidence of cause and effect will be required to design effective control measures, as well as to advance scientific knowledge and for national surveillance purposes.

5.5. The primary purpose of any outbreak investigation should always be to limit and control the spread of infection. However, in certain cases local authorities may decide that it is appropriate and proportionate to initiate a prosecution.

5.6. For outbreaks that appear to involve foods that are distributed regionally or nationally, or that are imported, it is important to notify the FSA immediately so that appropriate action can be taken across wider areas. There are additional requirements to notify the FSA when certain causative organisms have been identified i.e. *E.coli* O157, other VTEC, *C. botulinum*, *S. Typhi* and *S. Paratyphi*, or where the Food Authority considers the matter significant because of the potential effect on vulnerable populations, the numbers involved, the incidence of deaths etc.² Where a death occurs the police should be informed.

Preliminary phase

5.7. The first step in the investigation of an outbreak will be to assess the available information. The CCDC, local HPU or HPT and environmental health staff will need to consider whether or not reports indicate that the affected patients are all suffering from the same illness and whether there is any evidence of an association between them. A simple definition of a “case”, for the purpose of the investigation, should be established e.g. a

² Food Law Code of Practice 2006 Chapter 1.7

“case” is any person with diarrhoea who ate at a particular venue between specific dates. Such a definition will assist in including all those who could potentially be part of the outbreak, however the definition may need to be modified later. The cases should be interviewed to obtain a detailed history of the illness and of possible sources of the infection, in order to identify factors which are common to some or all cases. The design of the data collection forms can be critical to ensuring that the key information on possible causes of outbreaks is obtained. Expert epidemiological input e.g. from the Regional Epidemiology team or from HPA CfI/CDSC Wales should be used to design suitable forms. At the same time arrangements should be made to obtain appropriate specimens from the patients for laboratory investigation, if this has not already been done.

5.8. Depending on the circumstances e.g. the seriousness of the investigation and the likely source of infection, it may be advisable to contact neighbouring EHDs, GPs, hospitals, CCDCs/HPUs who may be aware of further cases that are part of the same outbreak. If the outbreak appears to be widespread, it will be particularly important to keep colleagues in other areas, the HPA CfI or CDSC Wales and the FSA informed.

5.9. At this early stage of the investigation, it may already be apparent that a formal Outbreak Control Team should be convened. The area in which the outbreak was first identified will normally take the lead in establishing the OCT. Whether or not a formal OCT is convened, having reviewed the available information and established a tentative diagnosis, the next stage will be to identify the requirements for any further investigation and agree the responsibilities for each aspect.

Food premises

5.10. If the vehicle of infection is thought to be food, a visit to implicated food premises should be made as soon as possible. An early site investigation can be extremely valuable as the amount of physical evidence will diminish with time. Inspections of food premises will be undertaken by EHPs, although the presence of a local HPU and/or HPA representative may be helpful to inform their advice on further epidemiological and laboratory investigations and in formulating control measures. The inspection could involve an EHD at some distance from the outbreak, and in such circumstances effective coordination and communication will be essential. For businesses that operate across local authority boundaries early communication with the Home Authority³ should be established.

5.11. The inspection should be conducted in accordance with the general principles outlined in the Food Law Code of Practice, which is regularly reviewed⁴. The range of information obtained during the inspection, from the management of the business and from food handlers, will depend on the type of premises, (e.g. catering operations, food manufacturer etc) but as much information as possible should be obtained on, for example:

- Menus, the food used, production schedules, food sources and supplies
- The processes; cooking, preparation, storage, service, possible cross contamination sites, temperature and processing records (including work schedules)

³ The Home Authority Principle- Guidelines for Home Authorities available from LACORS: www.lacors.gov.uk

⁴ Food Law Code of Practice 2006 Section 4 available from www.food.gov.uk

- Details of food safety management systems e.g. Hazard Analysis Critical Control Point systems, Safer Food Better Business systems and any associated records
- Staff details including sickness records
- Policies on pest control, cleaning, hygiene, medical screening of food handlers and staff training
- Source of raw materials
- Who the premises supplies to
- Whether food handlers have direct/indirect contact with farm livestock

5.12. It may prove helpful to produce a diagram of the premises, showing its layout and food flows and pathways for use within the OCT. This can be particularly useful for members of the OCT who have not visited the premises. Photographs also provide a useful permanent record of the condition of the premises at the time of the inspection.

5.13. The EHP should also take food samples and, if appropriate, environmental samples (see section 6). Where a preliminary hypothesis exists this should be used to formulate a sampling strategy based on expert input from relevant members of the OCT. It is important that samples of suspect foods are taken at this point, as at a later stage they may not be available, even though it may subsequently prove unnecessary to submit them to the laboratory.

5.14. In cases where contraventions of the law are identified, the risk they pose to public health should be considered and enforcement action commensurate with the risk taken e.g. seizure or detention of foodstuffs

to prevent further use of suspect food or closure of premises where an imminent risk to health has been identified (see 5.45-5.49). The requirements of the Police and Criminal Evidence Act 1984 with regard to the interviewing of persons suspected of having committed an offence must also be met.

5.15. Additional cases among food handlers or other customers may be identified from the initial site investigations. It should always be borne in mind that food handlers may have become infected because they also ate the food involved. Advice on the exclusion from work of infected food handlers can be found in the publication “Food Handlers- Fitness to work”⁵ and, for England, in the guidelines “Preventing person-to-person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers”⁶.

5.16. Where a follow up visit is made to approved meat premises, the Meat Hygiene Service should be invited to participate if they are the enforcement body.

Hospitals and other health care premises

5.17. In premises such as hospitals and other health care institutions, the staff responsible for routine infection control and the CCDC/ HPU/HPT will usually be the first people to be aware of a problem. In hospitals, initial control measures will be instituted by the hospital infection control team and the CCDC in conjunction with other professional staff and the management of the unit. If a foodborne outbreak is suspected, or where the case may be associated with food or food preparation, the local authority EHD should immediately be notified. It may be necessary at this

⁵ Food handlers fitness to work – available from the Food Standards Agency

⁶ Preventing person to person spread following gastrointestinal infections: guidelines for public health physicians and environmental health officers –available from http://www.hpa.org.uk/cdph/issues/CDPHvol7/No4/guidelines2_4_04.pdf

stage to convene an OCT. The principles for managing an outbreak of foodborne illness will be the same whether the outbreak occurs in a hospital or in the community. Closure of parts of the premises may have to be considered if person-to-person spread is a problem or if there are a large number of cases. In England, requirements for the need for a detailed, clear and explicit policy on the management of outbreaks in hospital can be found in “The Health Act 2006: Code of practice for the prevention and control of healthcare associated infections”⁷ and for care homes in “Infection control guidance for care homes”⁸. In Wales, in addition to the “Infection Control Guidance for Care Homes”, the NPHS has produced its own guidance “Infection Control Guidelines for Care Homes”.

5.18. The food preparation areas should be assessed if it is considered that the illness may have resulted from patients, visitors and/or staff consuming food produced there. It is important to remember that patients may consume food from vending machines on hospital premises, patients’ families may bring food into these premises and ambulant patients may go out to eat. Check for direct/indirect animal contacts.

Schools and residential homes outside NHS management

5.19. Investigations of foodborne outbreaks in schools and residential institutions can also present special features. Close working between CCDC and the EHP and the head of the school or residential care institution will be necessary. In residential homes it should be borne in mind that residents may help in food preparation or may even do some of their own cooking, possibly in separate facilities.

⁷ The Health Act 2006: Code of practice for the prevention and control of healthcare associated infections- available from www.dh.gov.uk. Updated 11 January 2008.

⁸ Infection control guidance for care homes – available from www.dh.gov.uk. This guidance is currently being revised.

Preliminary hypotheses

5.20. Assessment of the initial information from the laboratory, the interviews with patients and the inspection of the premises may make it possible to form a preliminary hypothesis as to the cause and mode of spread. This may enable appropriate control measures to be instituted at this point.

5.21. At the end of the preliminary phase, a decision will be needed about whether or not to continue the investigation to establish the cause of infection. It may be apparent at this stage that there is no further public health risk and in such circumstances the value of a further investigation will need to be assessed. It is important that the OCT (or investigators, if no formal OCT has been convened) reach an agreement in the light of priorities and the availability of resources. If further action is agreed, the additional steps listed in paragraph 5.1 should be considered.

Communications

5.22. It is essential to ensure effective communications between all those involved in an outbreak investigation. Regular meetings to share all relevant information such as the location of patients and contacts, details of any admissions to hospital and any deaths, identification and distribution of implicated foods will be required. It is important that an OCT continues its meetings up to and including the time at which the outbreak is deemed to be over. Formal minutes of these meetings should be taken which should clearly reflect why a certain action was/ was not taken at a certain time, what was the evidence for this action/inaction etc. These records should be kept in accordance with the document management procedures of member organisations.

5.23. Where appropriate, regular updates will need to be provided to relevant national and regional agencies such as the FSA e.g. to enable food alerts or general consumer information to be issued (see section 7).

5.24. Establishing good communications with PCT/LHB and LA staff who are not part of the investigation but who may be affected by the outbreak, for instance local hospitals, GPs and social services departments will also be important.

5.25. It is recommended that one person, not necessarily the CCDC, should be appointed to liaise with the media to ensure that the information provided is accurate and consistent. In some outbreaks, consideration may be given to making proactive use of the media by asking them to assist in case finding and to inform the public of specific local food hazards and those that are the subject of an FSA food alert. Media assistance in case finding is likely to be of value when it is targeted on clearly defined groups that cannot be reached in any other way, for example people who ate at a particular restaurant within a specified period. However, care should be taken to avoid unnecessarily alarming the wider population, or providing information which is or will be *sub judice*.

5.26. Where action is taken in relation to a food in distribution in the UK, communication of this will be agreed between the FSA, the LA and the FBO. The FSA will normally issue a communication in these circumstances. Further details of this are provided in section 7.

Record keeping

5.27. At the conclusion of the investigation the LA will need to determine whether or not subsequent legal action is necessary and coordinate a response to any civil action, coroner's hearing, etc. In order to provide accurate and detailed information for the courts, it is essential that all parties to the investigation keep a record at the time, of what was said, by whom, and when, together with details of any action taken. In a large outbreak it can be helpful to maintain a formal daily log under headings such as information received, lab reports received, meetings held, action taken etc. It should be remembered that legal action may be prejudiced if information about the incident is not carefully documented and controlled and that details of the investigation may be subject to external scrutiny as a result of the Freedom of Information legislation.

5.28. The keeping of detailed records also facilitates the writing up of the investigation for local and national purposes.

Confidentiality, data protection and access to health records

5.29. Like any personal health record, information about people involved in outbreaks of foodborne illness is confidential, and must be handled with the same regard to confidentiality. It is a general principle of the law of confidence that information given or obtained for one purpose should not be used for a different purpose without the express or implied authorisation of the provider of the information.

5.30. In general, personal information may be disclosed within the NHS on a strict "need to know" basis, provided it is required for an NHS purpose and anonymised wherever possible.

5.31. Information about a patient may be disclosed without their consent in certain special circumstances including when it is required by statute or Court Order or in the public interest, to prevent serious risk to the public health or the health of other individuals. An example of “public interest” justification is the need to investigate and control communicable disease by HPA/HPU and LA staff. Each disclosure by members of the OCT without the patient’s consent must be considered on its merits and should only be made after consultation with the appropriate health professional responsible for the patient’s care and treatment.

5.32. It must be borne in mind that information about individuals is likely to be subject to the provisions of the Data Protection Act 1998.

Descriptive epidemiology

5.33. Most outbreaks of foodborne disease warrant a descriptive study, because this can assist in identifying ways of preventing similar outbreaks in the future. The objective should be to provide a detailed description of the outbreak, its onset, size and progress (the epidemic curve), and the categorisation of cases by various characteristics, such as age and gender. Associations of place and time should also be sought. If formal, legally enforceable control measures are required, harder evidence from laboratory investigations and an analytical epidemiological study may also be needed.

5.34. Those at risk during the outbreak should be identified and data from as many cases as possible obtained through interviews. There is also an urgent need to identify affected persons, such as food handlers, who pose a risk of further spread.

5.35. In contrast to the preliminary stage, where a standardised questionnaire is used, a data collection form should be designed for each individual outbreak to ensure all necessary and relevant information is assembled in a uniform way, and is sufficient to classify all respondents as cases or not, using an agreed case definition. The Regional Epidemiology team, HPA Cfl or CDSC Wales may be able to assist in developing appropriate documentation to assist systematic collection of information whilst guarding against interviewer bias during data collection. Typically the following information will be required:

- Name and address
- Age and gender
- Whether information is from case, contact etc.
- Occupation, in particular whether in an occupation that poses an increased risk of spreading infection⁹
- Address of work place or school
- Information on any recent foreign travel
- Household and social contacts recently ill with similar symptoms
- Details, including times and places, of food and drink consumed
- Sources of domestic food, milk and water supplies
- Name and address of General Practitioner
- Date and time of first symptoms
- Nature of initial and subsequent symptoms
- Severity and duration of symptoms
- Hospital admission and/or antibiotic or other treatment
- Nature of any samples provided
- Outcome of illness

⁹ Preventing person to person spread following gastrointestinal infections; guidelines for public health physicians and environmental health officers –available from http://www.hpa.org.uk/cdph/issues/CDPHvol7/No4/guidelines2_4_04.pdf

5.36. The descriptive study allows the development of more detailed hypotheses as to source and mode of spread. It may suggest the need to collect further clinical, food or environmental samples (possibly including those from animals) for laboratory investigation or to carry out further laboratory or epidemiological studies.

5.37. Information may be needed from other sources. Where a direct/indirect animal source of infection is suspected or confirmed, the VLA regional laboratory should be contacted and a VIO invited to attend OCT meetings as outlined previously. The VLA will liaise with Defra colleagues regarding these incidents. In addition to undertaking any appropriate animal sampling for laboratory cultures, veterinary input can also assist with identification of management and husbandry factors that may have a bearing on the human health risks. VLA can also provide veterinary epidemiological input such as data reports of *Salmonella* serotypes in farm animal surveillance. Strains of animal origin can also be selected for further identification and comparison with human strains.

Analysis and interpretation

Collation of descriptive epidemiological data

5.38. The following activities comprise the collation phase

- Assembling data from people who may have been exposed to the suspect common foodstuff
- Plotting graphs of the numbers of cases and their dates and times of onset to produce an epidemic curve (see Glossary)
- Determining predominant symptoms and signs. This assists in ascertaining the agents likely to have caused the outbreak. The symptoms may be predominantly gastro-intestinal,

neurological or generalised and may differ from one person to another (see Appendix I)

- Calculating the incubation or “latent” period between ingestion of the contaminated food and the onset of illness (see Glossary)
- Calculating the incidence rates, that is the proportion of those exposed to the infection or chemical who have developed illness (see Glossary)
- Making time, place and person associations

Review of data and hypotheses

5.39. It is important at this stage of the investigation to consolidate and review all existing data, ensuring that wherever possible it is validated and that undue emphasis is not placed on any particular element of the data set. The tentative hypothesis to explain the most likely diagnosis, source, vehicle, site and manner of contamination and other causal relationships should now be reconsidered and revised as necessary.

Analytical epidemiology – cohort and case control studies

5.40. If it is decided to conduct an analytical study the CCDC/HPU will normally take responsibility for the design, analysis and subsequent interpretation of results. There are two common types of study that are used for this purpose:

Cohort studies: These are normally used when a group of people who have been exposed to a particular risk have been identified e.g. have attended a wedding function.

Case control studies: These are normally used when the “at risk” population is unknown or so large in relation to the number of people

ill that it is impracticable or uneconomical to include them all in a study. An example might be when a nationally distributed food is thought to be responsible for an outbreak.

Further details on these types of study, including a brief description of common statistical tests are provided in appendix III.

Interpretation of results of epidemiological investigation

5.41. Epidemiological evidence is often merely indicative of association between illness and the suspect food. A particular food may be implicated both by laboratory and epidemiological methods, but neither type of evidence should be considered conclusive in isolation. In order for a causal relationship to be inferred from epidemiological evidence the following criteria should be met:

- The investigation obtained evidence from most of the people in the study (a response rate of at least 60% and preferably more than 80%, achieved if necessary by “chasing up” non-responders)
- The time-relationship between the consumption of the food item and the onset of illness is consistent with the incubation period of the disease under investigation
- The probability of the association being due to chance is less than 1% ($p = 0.01$) if there are several food items being tested, or less than 5% ($p = 0.05$) if the study began with a hypothesis of an association with a single food item. In a small outbreak, interpretation is particularly difficult as these levels of significance may not be achieved and a high relative risk (odds

ratio of more than 5) should not be discounted if it is consistent with the results of environmental and laboratory investigations

- There are no important causes of bias in the conduct of the investigation. Bias can occur in the type of investigation pursued, in the way questions were asked, the choice of controls, in the analysis of data and in the presentation of the results

5.42. Even if the statistical evidence gives a significant pointer towards a specific cause of an outbreak there may not be sufficient evidence to satisfy the “*beyond reasonable doubt*” test of evidence for a prosecution. Where there is doubt on this issue legal advice should be sought.

Control measures

5.43. A systematic approach to the investigation and the rigorous application of scientific method will allow control measures to be implemented with greater confidence of success. This approach is also most likely to provide evidence which is of use in legal proceedings. Control measures will depend on the mode of spread, may be directed at the source (animal, human and environment) or at the vehicle, or both, and are dictated by the particular circumstances of each outbreak. Control may also occasionally include offering protection to persons at risk (for example, giving immunoglobulin to those exposed to infection during an outbreak of Hepatitis A). Continued monitoring, both of the control measures themselves and to identify any further cases of illness associated with the outbreak, is essential to ensure that the measures are effective.

Exclusion of cases and contacts from work, school and other forms of association

5.44. There are statutory powers to exclude cases, contacts of cases, or carriers of infection from work or school. Infected food handlers and other high risk categories are normally excluded from work while they have symptoms but may generally return to work when they have recovered, since good personal hygiene is usually sufficient to protect food from contamination. There are exceptions to this, notably VTEC, and criteria for return to work should be agreed by the OCT. Microbiological tests to demonstrate clearance of the organism are sometimes necessary and the CCDC will advise on this matter. Further guidance is provided in the HPA's guidance on preventing person to person spread following gastrointestinal infections¹⁰.

Seizure and detention of food

5.45. An appropriately authorised Environmental Health Officer (Food Law Code of Practice, Chapter 1.2) has powers to inspect, seize, arrange the temporary detention or removal and safe disposal of contaminated foodstuffs and can demand that processing documents and records be provided. Detailed guidance can be found in the Food Law Code of Practice, Chapter 3.4. Compensation may be payable by the LA in respect of any actions which subsequently prove to have been unwarranted.

5.46. In addition to the powers available to the LA enforcing officers, government ministers have powers, under Section 13 of the Food Safety Act 1990, to take suspected foodstuffs off the market.

¹⁰ http://www.hpa.org.uk/cdph/issues/CDPHvol7/No4/guidelines2_4_04.pdf

Closure of premises

5.47. Closure of premises or the use of hygiene emergency prohibition powers may need to be considered either at the stage when the source of infection is suspected or when it is confirmed. The appropriate powers are contained in the Food Hygiene (England) Regulations 2006 (and equivalent legislation in Scotland, Northern Ireland and Wales) in relation to food premises

5.48. The criteria to be used in determining whether closure of food premises is appropriate are described in the Food Law Code of Practice 2006 (Chapter 3.3). The appropriately authorised Environmental Health Officer (Food Law Code of Practice Chapter 1.2.9) must exercise professional judgement, in deciding whether or not the premises represent an imminent risk to health. Close consultation with the OCT is needed. The prime consideration must, of course, be protection of the public health.

5.49. The majority of individuals whose premises are implicated, however remotely, in an outbreak will wish to co-operate and may voluntarily offer to close. In such cases, the EHP should have regard to the Food Law Code of Practice 2006 (Chapter 3.3.2) which details the procedures that an authorised officer should follow when a food business operator undertakes a voluntary closure agreement.

The authorised officer should ensure the following:

1. The voluntary agreement should be confirmed in writing, with an undertaking by the food business operator not to reopen the business without the officer's approval.

2. Where any such agreement is to be made with a manager, the officer should confirm that the manager has the authority to undertake such an agreement.
3. Frequent checks are undertaken to ensure that the establishment has not reopened.

Final phase

5.50. The OCT (or the investigators if no OCT was convened) should decide when the outbreak can be considered over. A final “debriefing” meeting is useful, especially to consider any lessons which can be learned from the outbreak and its management and to discuss dissemination of this information to prevent future outbreaks. It is good practice for a report of the outbreak and its investigation to be written on conclusion and circulated to appropriate local and national authorities and individuals. However, it should be borne in mind that publication of full reports can prejudice legal proceedings. If possible, reports and results should be anonymised so that they can be shared with other agencies and professional colleagues without waiting for court proceedings to be completed. Under the Freedom of Information Act the local authority may be asked specific questions about an outbreak but if it is intended to publish a report at the conclusion of the investigation these questions might be addressed at that time, rather than during the outbreak. It may be wise to seek legal advice about production of final reports.

5.51. Local investigators should aim to write full reports on all but minor outbreaks as these can help in policy making decisions within LAs and PCT/LHBs. It may also be useful to send copies to the HPA CfI/CDSC Wales and the FSA. Such reports are also of help in discharging UK responsibilities

to report outbreaks of foodborne disease to the European Food Safety Authority. The report should examine the effectiveness of the investigation and draw out any lessons that have been learnt. A template to assist in the drafting of reports is appended (appendix V).

5.52. It is important that local agreement is reached about who “owns” the reports. It is strongly recommended that general outbreaks are fully reported to HPA CfI, as well as to the CCDC/Chairman of the OCT when investigations are complete.

6. Microbiological sampling and analysis

6.1. Outbreaks resulting from microbiological contamination of food are much more common than those due to chemicals and most investigations will involve a food microbiologist (Food Examiner), and often a clinical microbiologist. Some will also require assistance from a virologist. However, it is important to consider at the outset the possibility of a chemical cause and, if this seems likely, to seek advice from a chemist (public analyst) at an early stage.

6.2. In any episode of suspected foodborne illness the appropriate microbiologists should be consulted as soon as possible, and should be members of any Outbreak Control Team. The role of the microbiologists is to:

- i. advise on the appropriate clinical specimens (eg. faeces, blood) to be required/requested from the cases and from people thought to have been at risk;
- ii. advise on any appropriate food samples to be taken;
- iii. perform the appropriate microbiological investigations on the food to seek the suspect micro-organism, toxins etc.;
- iv. give advice on further sampling when a specific organism is found in the food, e.g. samples from food handlers, the environment, etc.;
- v. arrange for typing of organisms – eg. serotyping, phage typing – which will discriminate between similar but distinct strains which might otherwise be mistakenly thought to be related.

6.3. In large or complex outbreaks involving the use of more than one laboratory the Regional Microbiologist will assist in the co-ordination and effective use of laboratory services.

6.4. Where there is veterinary involvement with the investigation of an animal associated outbreak, the VLA will usually liaise directly with the Department of Gastrointestinal and Emerging Zoonotic Infections (GEZI), CfI Colindale, or with NPHS in Wales. In the case of VTEC O157 outbreak investigations for example, presumptive sorbitol non-fermenting *E coli* O157 isolates from animals will be sent directly to GEZI for VT confirmation and PFGE profiling as appropriate.

Food Samples

6.5. Food sampling should be an integral feature of the investigation. The microbiologist/analyst should be supplied with all the relevant information collected by the investigating officers. All clinical, food and environmental samples related to a particular outbreak must be clearly identified with an outbreak specific code or number. Official samples must be submitted to an Official Food Control laboratory accredited against ISO 17025. All samples should be well recorded and labelled and continuity of handling from sampling to report stage should be recorded to satisfy the Food Safety Act 1990 and the Police and Criminal Evidence Act 1984 criteria.

6.6. The primary objective in obtaining samples is to provide a representative sample of the food and to submit it to the laboratory in a condition bacteriologically or chemically unchanged from that existing at the time of sampling. Correct sampling requires careful attention. The

sampling officer should be experienced in the taking of samples in order that the appropriate measures are taken to prevent, as far as possible, any contamination of the food or the samples taken. It is difficult to set out fixed procedures to be followed in every situation in a document of this kind.

6.7. Samples of at least 100 grams of food are the ideal. However, smaller “left over” samples, even if retrieved from dustbins, may be useful. Partially consumed packaged or canned food should be sent in its container and any unopened packages or cans belonging to the same batch should be included. Any packages not sent for examination should be retained until after investigations have been completed. The sampling officer should keep a record of as much detail as possible about where the food was found and its storage conditions so that the significance of the microbiological results can be assessed.

6.8. Sample temperatures and humidity should not be substantially altered during handling, and cross contamination should be avoided. Cold and frozen food should be kept as close to its original temperature as possible during transit, although hot food need not necessarily be kept hot. The Local Authority should have an emergency sampling kit containing spoons, spatulas, tweezers, a supply of containers, thermometer, insulated boxes etc. For microbiological examination sterile equipment is required and for some samples aseptic sampling techniques will be necessary.

6.9. A training video covering the principles of sampling for analysis/examination of food has been produced by the Food Standards Agency¹¹.

¹¹ Food Sampling Advice for Enforcement Officers, obtainable via the Enforcement mailbox at enforcement@foodstandards.gsi.gov.uk

Environmental Samples

6.10. Environmental samples may be used to determine the nature and the extent of any contamination. Samples may be taken from working surfaces, food equipment and containers. Surfaces which food handlers may have touched such as door handles, refrigerators, and switches may also be swabbed, as may be cleaning and other equipment such as sinks, nail brushes and wiping cloths. It should be noted that, even though superficial cleaning may have been carried out, the organism may still be present in numbers sufficient to be identified in sampling. Drain or sewer swabs may, occasionally, be useful for investigating an infected area. Environmental sampling can be extremely time-consuming and requires experienced staff if the results are to be meaningful. If carried out it should be done as part of the food hygiene investigation in suspect premises. However, it is essential to know what events have taken place in the premises before the samples were taken. For example, environmental swabs may be of limited value if, between the outbreak occurring and the commencement of the investigation, there has been a substantial amount of cleaning and disinfection in the environment, or an appreciable amount of time has elapsed between the outbreak and site investigation. The results should be carefully evaluated if misleading conclusions are to be avoided.

6.11. Collection of environmental samples should be carried out aseptically, using the correct media and techniques. It is of course essential to avoid cross-contamination. Knowledge of the operating environment will assist in determining the most effective sampling points. Wherever possible, advice should be obtained from the HPA or NPHS before instituting a sampling exercise.

6.12. See comments above regarding collection of faecal and other animal-associated environmental samples by VLA (para 5.37).

Sampling and PACE

6.13. Food samples and premises swabs whose microbiological validity is acceptable for outbreak control purposes may not be admissible as evidence in any subsequent legal action if they are not taken in accordance with statutory Codes of Practice and professional guidelines. This may lead to the collapse of any associated prosecution at a later date.

6.14. Every effort should be made to ensure that samples are valid for use as evidence later. In most cases, ensuring an EHP is contacted and can be available on site with the necessary sampling materials and paperwork should be sufficient. However, public health concerns will always take priority. If medical or local authority officers are already on the site of the potential source of an outbreak, and there is a significant risk of delay in the clinical investigation and/or evidence being removed or destroyed before the arrival of an EHP to take samples formally, officers should then use whatever means are available to them to ensure that the origin of the outbreak can be confirmed.

Bacteriological Typing

6.15. When pathogenic bacteria are isolated from samples, their presence alone may be insufficient to support a presumptive association. Some organisms are very common and their presence in related specimens may be coincidental. Further subdivision into types/subtypes may show them to be distinct and therefore unrelated,

or still indistinguishable, thus increasing the significance of their isolation.

6.16. The most common typing schemes used in relation to foodborne pathogens are serotyping and phage typing. It may be necessary to use more than one such scheme for optimum discrimination. Detailed typing is usually undertaken by specialist reference laboratories, most of which are provided by the HPA, and listed on the HPA website. The staff of these laboratories can provide expert advice on appropriate sampling and on the interpretation of the results, such as information about the type of food with which a particular strain of *salmonella* has often been associated. Early arrangements should be made with reference laboratories to 'fast track' isolates associated with outbreaks.

6.17. Pulsed field gel electrophoresis (PFGE) is invaluable for VTEC O157 outbreak investigations and permits cases to be matched with putative sources.

6.18. Speciation of *Cryptosporidium* during outbreaks into *C parvum* or *C hominis* using Polymerase Chain Reaction (PCR) can be an invaluable tool during outbreak investigations in attributing source (including likely animal involvement). This can be performed at the *Cryptosporidium* Reference Laboratory, Swansea (human samples) or at VLA Weybridge (animal samples).

7. The Food Alert System

7.1. The Food Alert System is operated by the Food Standards Agency. All Local Authorities must have regard to and implement the Code of Practice made under Section 40 of The Food Safety Act 1990, and Regulation 24 of the Food Hygiene (England) Regulations 2006. Section 1.7.6 of the Code of Practice requires LAs to report all cases of serious localised and serious non-localised foodborne illness to the Agency as soon as they become aware of the issue.

7.2. Since the implementation of Regulation (EC) 178/2002 on General Food Law an obligation has been placed on Food Business Operators under Article 19 to inform the competent authorities if they consider or have reason to believe that a food that they have placed on the market may be injurious to health. The Agency is a designated competent authority.

7.3. The operation of the system has already been described in relation to food hazards identified as a result of outbreak investigations (paras 2.13 and 5.6). In the event of a serious localised incident – which may be an outbreak or the identification of a food hazard – the food authority should notify the FSA immediately. Either the electronic form available via the FSA web site on its enforcement portal or the hard copy form available at annex 4 in the Code of Practice can be used for this purpose. In the event of an outbreak, HPA Cfl or CDSC Wales should also be notified immediately. The FSA will liaise with appropriate food authorities on further action to be taken. Responsibility for action at local level remains with the food authority and HPU/HPT.

7.4. Each year, the FSA investigates a large number of reported incidents and will involve other Government Departments if it is deemed appropriate. It will assess the risk to public health and take action based on the best information available at the time. As it is the responsibility of the FBO to produce safe food, in most cases, the FBO or importer will volunteer to withdraw the food leaving the local enforcement authority or authorities to monitor the effectiveness of this action.

7.5. Action may be required outside normal office hours and procedures are in place to enable urgent action to be taken, if necessary on a 24-hour basis. All food authorities have a list of names and telephone numbers of contacts within FSA for use outside office hours, and are required by the Code of Practice to provide the FSA with their own out of hours contact points and to ensure that this information is kept up to date.

7.6. The formal Food Alert System is implemented when there is a need at national level to inform food authorities of the withdrawal or recall of a food product, or to require enforcement officers to ensure that the product has been withdrawn.

7.7. FSA issues two types of Food Alert:

- Food Alert For Action (FAFA) – this requires some form of action by enforcement officers.
- Food Alert For Information – this is for information only – usually informing enforcers and the public that a withdrawal/recall has taken place.

7.8. Food alerts are issued to each local authority. In addition they are publicised via the Agency's website.

7.9. Information for the public is usually issued by the FBO. FSA will normally issue publicity referring to such information or, in cases where this has not been done by the FBO, it will consider ways in which people who may have purchased an affected product can be made aware of this.

Appendix I

Features of foodborne illness

PATHOGEN	Bacillus cereus food poisoning – emetic and diarrhoeal type.
MICROBIOLOGY	Gram positive motile rod producing heat resistant spores and one or more toxins including a heat labile enterotoxin and a heat resistant emetic toxin. Both pre-formed in foods and enterotoxin may be formed in the gut.
DETAIL	Aerobic facultative anaerobe.
TEMPERATURE RANGE	10 – 50° C Optimum 28 – 35° C. Some psychrotrophic forms show slow growth at 4 – 9° C.
pH	4.3 – 9.3
INFECTIVITY	Symptoms arise after ingestion of large numbers of bacteria or pre-formed toxin.
COMMONLY ASSOCIATED FOODS or SOURCES	Cereal products. Rice, pasta, spices and dried food. Also environmental.
SPREAD	Contaminated cooked food especially rice
SYMPTOMS	Acute nausea, vomiting, stomach cramps. Diarrhoea.
DURATION of ILLNESS	24 hours.
INCUBATION	1 – 5 hours vomiting 8 – 6 hours diarrhoea
DIAGNOSIS	Bacteria or toxin detected.
CONTROL	Good food storage and handling.
EXCLUSIONS AFTER CLINICAL RECOVERY	Not appropriate.

PATHOGEN	Campylobacter spp
MICROBIOLOGY	Gram negative, non – sporing curved motile rod.
DETAIL	Microaerophilic
TEMPERATURE RANGE	Thermotolerant – above 30° C, optimum 42 – 45° C
pH	6.5 – 7.5
INFECTIVITY	As few as 100 organisms if accompanied by low gastric acidity.
COMMONLY ASSOCIATED FOODS or SOURCES	Poultry, meat, dairy products and shellfish. Also environmental and animal contact.
SPREAD	Via food, cross contamination, water or infected animals and their food. Person to person spread is uncommon.
SYMPTOMS	Abdominal pain, diarrhoea (possibly bloody) headache and fever.
DURATION of ILLNESS	2 – 7 days, but may be associated with complications such as Guillain-Barré syndrome. Protracted excretion occasionally occurs (consider antibiotic treatment).
INCUBATION	1 – 10 days. Usually 3 – 5 days.
DIAGNOSIS	Bacteriology – typing not normally undertaken unless specifically requested. Wide range of techniques available; discuss with microbiologist.
CONTROL	Pasteurisation, effective water treatment, thorough cooking and attention to cross contamination.
EXCLUSIONS AFTER CLINICAL RECOVERY	Until 48 hours after normal stool and symptom free.

PATHOGEN	Clostridium botulinum Medical Emergency Toxins A, B, E, F
MICROBIOLOGY	Gram positive motile rod producing heat resistant spores and one or more toxin.
DETAIL	Anaerobe
TEMPERATURE RANGE	Depends on type: 10 – 50°C proteolytic types A, B & F 3.3 – 48°C non-proteolytic types B, E & F
pH	Minimum 4.6 (proteolytic) 5.0 (non proteolytic)
INFECTIVITY	Toxin lethal at low doses
COMMONLY ASSOCIATED FOODS or SOURCES	Preserved foods, fish and animal intestinal tracts. Environmental soil and marine sediments.
SPREAD	Raw undercooked or under processed foods. Canned food where suitable pH for growth and anaerobic conditions exist. Contaminated honey associated with infant botulism (due to ingestion of spores rather than pre-formed toxin). Intravenous drug use may result in wound botulism.
SYMPTOMS	Initial period of GI symptoms followed by neurotoxin effects such as dry mouth, double vision, difficulty in swallowing, paralysis and respiratory failure. Urgent administration of antitoxin required.
DURATION of ILLNESS	May be of long duration lasting months.
INCUBATION	2 hours – 5 days depending on dose. Usually 12 – 36 hours.
DIAGNOSIS	Toxin or organism in food or faeces.
CONTROL	Food processing technology.

PATHOGEN	<i>Clostridium perfringens</i>
MICROBIOLOGY	Gram positive spore forming rod.
DETAIL	Anaerobic. Spores survive normal cooking. Multiplication occurs if the temperature control is inadequate. Ingestion of large numbers of vegetative cells results in enterotoxin production in the small intestine.
TEMPERATURE RANGE	15 – 50° C Optimum 43 – 45° C
pH	6 – 7 optimum.
INFECTIVITY	Usually > 10 ⁵ micro-organisms are required.
COMMONLY ASSOCIATED FOODS or SOURCES	Stews, rolled roasts and pies. Contamination from animal faeces, soil, sewage & dust and feeds of animal origin.
SPREAD	Contaminated bulk cooked meat left at ambient temperature during cooling and storage.
SYMPTOMS	Diarrhoea and acute abdominal pain; vomiting uncommon.
DURATION of ILLNESS	24 hours
INCUBATION	6 – 24 hours Usually 10 – 12 hours
DIAGNOSIS	Presence of enterotoxin in faeces. Identification of same serotypes from food and faeces.
CONTROL	Adequate cooling, storage and reheating procedures.
EXCLUSIONS AFTER CLINICAL RECOVERY	Not appropriate.

PATHOGEN	Cryptosporidium species
MICROBIOLOGY	Protozoan parasite producing oocysts.
DETAIL	
TEMPERATURE RANGE	
pH	
INFECTIVITY	Oocysts are resistant to chlorine and may be very infectious.
COMMONLY ASSOCIATED FOODS OR SOURCES	Drinking water and water used in food preparation with no further cooking. Infected animals and people.
SPREAD	Water is the common vehicle and person to person spread via the faecal-oral route.
SYMPTOMS	Diarrhoea and abdominal pain.
DURATION of ILLNESS	1 – 3 weeks
INCUBATION	7 – 14 days
DIAGNOSIS	Detection of oocysts in faeces. Genotyping is available.
CONTROL	Good water treatment, including filtration. Oocysts not controlled by water disinfectants.
EXCLUSIONS AFTER CLINICAL RECOVERY	Not appropriate.

PATHOGEN	Enterotoxigenic <i>Escherichia coli</i> (ETEC)
MICROBIOLOGY	Gram negative non spore-forming rod producing heat-labile and heat-stable toxins.
DETAIL	Aerobic, facultative anaerobe Principal cause of “travellers diarrhoea” and severe dehydration in children.
TEMPERATURE RANGE	10 – 45° C Optimum 37° C
pH	Minimum 4.5
INFECTIVITY	Usually > 10 ⁶ bacteria to produce a case
COMMONLY ASSOCIATED FOODS OR SOURCES	Human excreters
SPREAD	Foodborne, waterborne and person to person spread.
SYMPTOMS	Acute watery diarrhoea, dehydration and shock.
DURATION of ILLNESS	1 – 5 days
INCUBATION	10 – 72 hours
DIAGNOSIS	Culture of faeces, toxin immunoassay and DNA probes.
CONTROL	Good personal hygiene. Thorough cooking of food. Antibiotic prophylaxis is not routinely recommended.
EXCLUSIONS AFTER CLINICAL RECOVERY	None

PATHOGEN	Verocytotoxin-producing <i>Escherichia coli</i> (VTEC)
MICROBIOLOGY	Gram negative non spore-forming rod producing verocytotoxin.
DETAIL	Aerobic, facultative anaerobe.
TEMPERATURE RANGE	10 – 45° C Optimum 37° C May survive at temperatures below 0° C
pH	Characteristically acid resistant May grow at pH 4.5
INFECTIVITY	Very small numbers of bacteria (<20) may cause illness.
COMMONLY ASSOCIATED FOODS OR SOURCES	In USA ground beef is the main source but less so in the UK where milk and milk products are often implicated along with vegetables, contaminated water and environmental contact. Person to person spread is also a feature of this disease along with animal contact.
SPREAD	Cross contamination from raw foods to cooked food. Cattle faeces contaminating food products or water supplies, direct and indirect contact with excreting animals including a wide range of species such as cattle, sheep, goats, pigs, horses and wild rabbits. Environmental contamination and person to person spread.
SYMPTOMS	A range of symptoms possible. Diarrhoea, abdominal pain, bloody diarrhoea and haemolytic uraemic syndrome.
DURATION of ILLNESS	Variable

INCUBATION	1 – 12 days Usually 12 – 60 hours
DIAGNOSIS	Stool culture and serotyping. Gene probe for toxins. Phage and genotyping are available.
CONTROL	Good food handling and thorough cooking of meat. Pasteurisation and the proper production of dairy products. The control of cross contamination and person to person spread. Environmental advice.
EXCLUSIONS AFTER CLINICAL RECOVERY	2 negative consecutive stools at intervals of at least 48 hours for risk groups A – D ¹² or as prescribed by the OCT during an incident.

¹² Preventing person to person spread following gastrointestinal infections; guidelines for public health physicians and environmental health officers - available from http://www.hpa.org.uk/CDPHvol7/No4/guidelines2_4_04.pdf

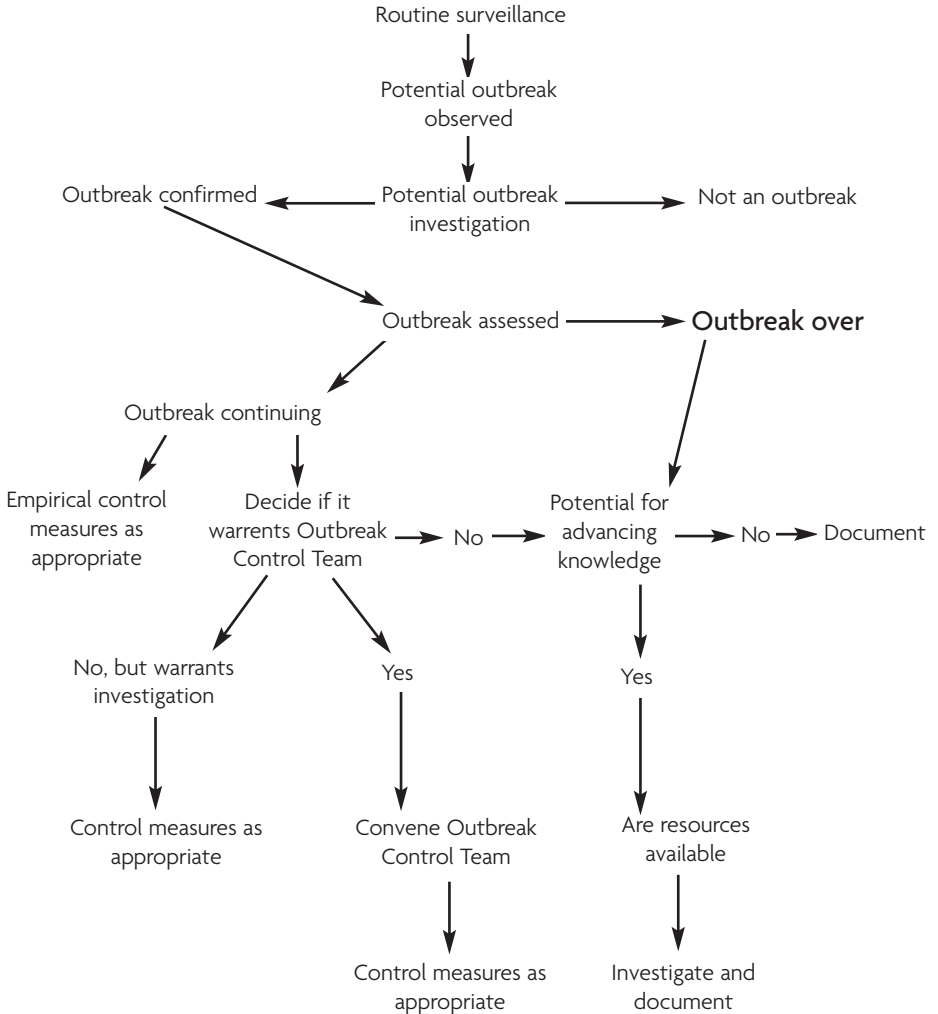
PATHOGEN	Giardia lamblia
MICROBIOLOGY	Protozoan parasite with an environmentally resistant cyst.
DETAIL	Anaerobic Infection is non invasive and there is a high rate of asymptomatic carriage.
TEMPERATURE RANGE	
pH	
INFECTIVITY	25 – 100 cysts may cause illness.
COMMONLY ASSOCIATED FOODS OR SOURCES	Water and contaminated salads.
SPREAD	Contaminated water, faecal-oral, especially young children. Person to person spread is becoming recognised. Very occasionally direct animal source (e.g. from sheep) or water contaminated with animal faeces.
SYMPTOMS	Abdominal pain and diarrhoea. Flatulence and foul smelling greasy stools. Weight loss.
DURATION of ILLNESS	Variable, may be relapsing.
INCUBATION	3 – 25 days Usually 7 – 10 days
DIAGNOSIS	Detection of cysts or trophozoites in the stool.
CONTROL	Treatment of water supplies. Personal hygiene. Anamicrobial treatment of cases.
EXCLUSIONS AFTER CLINICAL RECOVERY	None

PATHOGEN	Listeria monocytogenes
MICROBIOLOGY	Gram positive, non-sporing rod.
DETAIL	Aerobic, facultative anaerobe. Produces a range of symptoms and conditions from flu like illness to septicaemia and meningoen­cephalitis. May cause abortion in pregnant women.
TEMPERATURE RANGE	Psychrotrophic, may grow at temperatures below 0° C. Optimum 30 -37° C
pH	Minimum 4.3
INFECTIVITY	Not high but has a significant case fatality in vulnerable groups.
COMMONLY ASSOCIATED FOODS OR SOURCES	Milk, milk products, meat pâtés.
SPREAD	Widely distributed throughout the environment, including animals. Can tolerate relatively high salinity and cold and is therefore a feature of stored food where salt and chilling are control steps
SYMPTOMS	Flu-like illness, meningoen­cephalitis/septicaemia and spontaneous abortion.
DURATION of ILLNESS	Variable.
INCUBATION	Variable but likely to be long. 3 – 21 days (or longer) is often quoted.
DIAGNOSIS	Blood or CSF culture. Serotyping, phage typing and genotyping are available.
CONTROL	This is a difficult disease to control as the organism is so widely distributed and may be excreted by healthy individuals. Contact with animals, their young and animal feed is a particular hazard for pregnant women and should be avoided.
EXCLUSIONS AFTER CLINICAL RECOVERY	None

PATHOGEN	Salmonella species excluding <i>S.typhi</i> and <i>S.paratyphi</i>
MICROBIOLOGY	Gram negative rods
DETAIL	Aerobic, facultative anaerobe
TEMPERATURE RANGE	Mesophilic, but can grow at temperatures down to 6 – 8° (some species lower). Killed by heating to at least (70° for 2 minutes)
pH	Minimum 4.0
INFECTIVITY	Normally large numbers of bacteria required to produce a case. Certain foods, e.g. chocolate, protect the organism from gastric acid and the infective dose is lower. It is also lower in vulnerable groups such as the young and the elderly.
COMMONLY ASSOCIATED FOODS OR SOURCES	Poultry, eggs, unpasteurised milk, meat and infected food handlers. Domesticated and wild animal species can carry the infection and excrete the organism intermittently or during clinical episodes.
SPREAD	Cross contamination, inadequate cooking, poor food handling and infected food handlers.
SYMPTOMS	Malaise, diarrhoea, fever, vomiting and abdominal pain. Septicaemia, peritonitis and meningitis are rare occurrences.
DURATION of ILLNESS	2 or 3 days to 3 weeks.
INCUBATION	6 – 72 hours Usually 12 – 36 hours
DIAGNOSIS	Stool culture. Serotyping, phage typing and genotyping are available.
CONTROL	Good food hygiene, personal hygiene, and attention to storage. Attention to good temperature control.
EXCLUSIONS AFTER CLINICAL RECOVERY	None

Appendix II

Initial assessment of an outbreak



Appendix III

Cohort and case control studies

1. These two epidemiological study designs provide a scientifically rigorous framework for the assessment of the relationship between exposure to a risk factor and the incidence of illness. The type of design that is appropriate will depend on the nature of the outbreak. Both the design and the analysis of the results of these studies will normally be undertaken by the CCDC, as training in epidemiology is required to ensure effective collection of data and interpretation of results; for example, in the identification of confounding factors and the avoidance of bias. If for any reason the CCDC does not undertake this work, the design (especially the choice of controls) and the analysis and interpretation should be discussed with the CCDC or another epidemiologist early in the investigation and following data collection. The Regional Epidemiology team or HPA Cfl/CDSC Wales are able to provide expert advice.

Cohort studies

2. Cohort studies are more commonly used than case-control studies in foodborne outbreaks because they fit the circumstances of a group of people, who have eaten together, with illness becoming recognised relatively soon afterwards. The “cohort” is the complete group of people who attended the event, and so were “exposed” to the foods being investigated. The food consumed by each member of the group, and if possible the amount, is recorded.

3. The cohort method has the advantage over case-control studies that there is no need to identify and select controls, so the possibility of bias is reduced. The statistical analysis is similar to case-control studies.

Case-control studies

4. A case-control study is employed when it is not possible to identify and investigate a defined population at risk, or when that population is so large in proportion to the numbers who are ill that it is not cost effective to include them all in the study. An example would be when there is a sudden rise in the incidence of an uncommon serotype of *Salmonella* with cases spread over a wide area. Although it may be clear that there is an outbreak, there may not be a single food in common. Interviews with known cases may suggest several foods, distributed throughout the affected area that could be contaminated. By showing that cases are significantly more likely than other people to have eaten one of the foods under investigation, the most likely food can be determined. The diet of “other people” is discovered by asking a sample of well people to be “controls” by providing details of the foods that they have eaten.

5. In a case-control study, there has to be a specific hypothesis that consumption of a single or a small number of foods is associated with disease. Controls should be people who have had similar opportunities to eat the suspect foods. Consideration needs to be given to whether or not controls should be matched. For instance, if the suspect food is a confectionery bar and most of the cases are children, matched controls would be children of similar age, living in the same area and with potentially similar diets. Controls can be chosen from neighbours

and friends of the cases or from various registers and lists, such as people who are registered with the same general practitioner. Each case will usually have one, or preferably more, controls. When the data for a case-control study have been collected, they are analysed by standard statistical methods.

Tests for statistical significance

6. Data showing the differences between the proportions of those who are ill that ate a suspect food and of those who are ill but did not eat it (and of any groups for which incidence rates or means were calculated) should be tested for statistical significance. If the calculation shows that there is a statistically significant difference between those eating and those not eating the suspect food this gives support to the theory that the food was contaminated. The chi-square (χ^2) and Fisher's Exact tests are the most commonly used in this calculation. The level of significance required to demonstrate that a difference is not merely a result of chance (i.e. not due to any cause) is specified beforehand. The commonest significance level used is 95%; that is, there is a one in 20 (5%) likelihood that chance alone would account for the statistical difference between the two groups.

Appendix IV

Checklist for product recalls

This aide memoire for product recalls is intended to be used in respect of product recalls as part of an investigation. It may be modified as appropriate dependent upon the product and precise circumstances of any particular recall.

1. It is recommended that, at the beginning of any outbreak which has a potential to have significant public health implications, an experienced environmental health officer should be designated whose responsibility is to lead a well organised team of officers in tracing potentially contaminated food. This team should be encouraged to use initiative during their investigations.
2. As soon as a Food Authority becomes aware of a problem which goes beyond its boundaries, or where the problem is of a serious nature, then the FSA should be advised. At the earliest possible stage the Food Authority should provide the Agency with all of the available information specified in the relevant Code of Practice made in terms of the Food Safety Act 1990. The Agency will then as soon as possible consider the need for a Food Alert to be issued, or the need for action to be taken in terms of the Food and Environment Protection Act 1995 or any other measures in terms of food safety legislation.
3. In the event of a major outbreak, consideration should be given at an early stage to the necessity of seeking additional staffing support from another local authority.

4. Business operators must be encouraged to give full and honest information in connection with the precise nature of food produced and its distribution pattern. If necessary, EHOs should use the powers available in the Food Safety Act 1990 to ensure that they are provided with accurate information. All relevant information concerning potentially contaminated food must be obtained at the earliest possible stage in the investigation.
5. Where appropriate, immediate checks should be made of relevant business records, including consignment notes, invoices and computer system records. Relevant staff in premises implicated in foodborne illness outbreaks should be quickly identified in order to lead the search for relevant documentation.
6. Powers of inspection, detention and seizure of food provided to EHOs by the Food Safety Act 1990 should be used where necessary. The overriding consideration in the use of these powers should be the protection of public health.
7. Where voluntary withdrawals of food are accepted then the details of the voluntary agreement should always be immediately confirmed in writing to avoid any future doubt.
8. Effective media relations are important and this should be given urgent attention. It can often be helpful to have someone whose function it is to service the media, e.g. a Public Relations Officer. Consideration should be given to the issue of timely press releases containing relevant information about potentially contaminated products.

9. Every step should be taken to alert domestic customers as well as trade when an outbreak occurs, e.g. cooked meats can be stored in domestic freezers for months. Notices should be placed in shop windows warning customers not to eat, but to destroy or return, any contaminated products purchased from relevant premises, including those which may be in fridges or freezers. The notice could also ask customers to spread the word of possible contamination of products. In relevant circumstances the police may be asked to assist in delivering food recall messages.
10. Consideration should be given to the need to provide advice concerning not consuming products which may have been cross-contaminated by products implicated in the outbreak.

This checklist of some matters which need to be considered in relation to product recalls is not exclusive and each case needs to be considered on its own merits:

- Establish who is in overall charge of the recall operation
- Agree detail of the product(s) concerned
- Inform/discuss with supplier(s)
- Inform/discuss with insurers and encourage supplier(s) to do so also
- Agree the precise nature of the fault
- Identify details of incidents which have occurred
- Agree the hazard presented, risk level and degree of urgency

- Establish the batch/code number or date of affected products and their location
- Establish the number of products affected
- Establish how the fault arose
- Confirm why only those products affected are at risk
- Establish the company's formal response
- Have available a list of key emergency telephone numbers
- Establish the format of in-store notice
- Establish the media plan
- Establish the format of advertisement
- Establish the wording of a radio/TV announcement
- Establish how to deal with media enquiries eg. nominated spokesperson
- Establish who/how to deal with customer enquiries
- Consider methods of communication with customers
- Inform Trade Associations and agree communications between food business(es) and Government bodies as appropriate, e.g. FSA and the Home Local Authority.

Appendix V

A Template for an Outbreak Control Team Report

1. Introduction

A brief summary of the outbreak and setting the scene.

2. Background

Optional section depending on the outbreak and implicated organism(s). If uncommon pathogen implicated, give brief description of clinical features, incubation period, infectious dose, source and modes of spread, diagnosis and treatment, etc. Also give background prevalence of the disease locally, nationally and globally if relevant.

3. Investigation of the outbreak

3.1 Epidemiological

(i) Descriptive:

description of initial cases, case definition and hypothesis generation, enhanced surveillance

(ii) Analytical:

case control and/or cohort studies.

3.2 Environmental

e.g. food, water, risk assessment of production and distribution including food chain, etc, staff interviews

3.3 Microbiological/Toxicological

local labs, reference labs, etc, clinical, food/water and environmental samples

4. Results

4.1 Epidemiological

4.2 Environmental

4.3 Microbiological

5. Control measures

5.1 Overall co-ordination and management of the outbreak

5.2 Care of cases

5.3 Prevention of further cases (primary and secondary spread)

5.4 Public information

5.5 Information to professionals/businesses, etc

5.6 Outline of food safety enforcement action

6. Discussion and conclusion

7. Lessons learned and recommendations

8. Appendix

This report should be agreed by all members of the OCT. If there is any disagreement among OCT members on the content of the report, this should be stated clearly in front of the report.

Appendix VI

Glossary

Note: This glossary is intended as an aid to the reading of the main text and is not intended to be definitive.

Epidemic curve

A graph that depicts the distribution of the time of onset of the initial symptoms of all cases that are associated with the outbreak. The unit of time used varies dependent on the duration of the outbreak and the specific disease. Helps to determine whether the outbreak originated from a common source, vehicle or person to person spread.

Epidemiological associations

Time associations refer to onset of similar illnesses within a few hours or days of each other. Place associations refer to purchasing food from the same place, eating at common venue, drinking from a common source, residing at the same establishment or attending the same event or activity. Person associations refer to common experiences (e.g. eating same foods, drinking same water, handling same animals, caring for same person) or being of the same age, sex, race, occupation etc.

Incubation period

The interval between ingestion of contaminated food and appearance of initial symptoms or signs of illness. The period will vary dependent on causative agent, dose ingested, vehicle, etc. The median and range of the incubation period, plus predominant symptoms and signs, permit

a judgement to be made whether the case is likely to be an infection or intoxication and thus determine the most appropriate laboratory tests.

Incidence/attack rates

Used to identify the responsible source or vehicle and confirm an association of either illness or food with groups of persons. The investigator may:-

- i. Calculate attack rates among persons who shared common meals.
- ii. Calculate food specific attack rates.
- iii. Calculate incidence rates for various groups and places.
- iv. Calculate food preference rate.

$$[\text{Rate} = (\text{number affected}/\text{number exposed})]$$

Outbreak

An incident in which two or more persons have the same disease, similar symptoms or excrete the same pathogens and in which there is a time, place and/or person association between these persons. An outbreak may also be defined as a situation when the observed number of cases unaccountably exceeds the expected number. A foodborne or waterborne outbreak results from ingestion by those affected by food or water from the same contaminated source or which has become contaminated in the same way.

Phage Typing

Parasitic viruses which attach to bacteria and in some cases destroy bacteria are used to sub-divide strains within a particular serotype. Bacterial strains are usually susceptible to several phages, the pattern of which helps identify the phage type. Phage typing is of practical importance in sub-dividing certain *Salmonella* species, e.g. *S.Typhimurium*, *S.Enteritidis*, *S.Hadar*, *S.Virchow*, as well as *Listeria monocytogenes* and VTEC O157.

Serotyping

Serotyping of bacteria, particularly of the *Salmonella* genus, is a time-consuming but relatively accurate method of identification. *Salmonella*, *Clostridium perfringens*, *Bacillus cereus*, *E. coli*, *Listeria monocytogenes*, *Campylobacter*, and *Yersinia enterocolitica*, can be typed this way. Antisera produced against specific antigens are mixed with the bacteria. Agglutination with known antisera helps identify the organism.

© Crown copyright
Published by Food Standards Agency
May 2008
FSA/1250/0508