CHAPTER

1

Overview of CIFOR Guidelines

Although a variety of steps for investigating an outbreak exist in the training literature, there is no agreed upon, standard approach for response to an outbreak. Why is this? Simply put, no one set of steps is appropriate for all outbreaks. The response varies with the outbreak and surrounding circumstances (e.g., etiologic agent, number of cases, and likely source of exposure). The response also varies depending on the agencies involved, available resources, and the expertise of investigators.

To add to the possible range of responses to an outbreak, certain activities might be required by local ordinance or state statute in some jurisdictions but not others. In addition, some activities that are considered part of an outbreak response are routinely undertaken in some jurisdictions before an outbreak is ever recognized (e.g., follow-up of cases to collect detailed information about exposures).

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The challenge of developing standard steps for an outbreak response is amplified by the fact that investigation activities are rarely undertaken sequentially or linearly. Some activities can take place concurrently with other activities, while others must wait for the results of earlier activities. Furthermore, some activities, such as communication or implementation of control measures, occur repeatedly throughout an investigation.

Nonetheless, a description of the steps involved in the response to an outbreak is instructive. Such a portrayal, although not an accurate depiction of reality, is more easily understood by the novice who needs to learn about outbreak investigation. A description also emphasizes the need to work systematically through each outbreak investigation, allowing activities to consciously be omitted or rearranged, but not overlooked in the urgency of the moment.

The CIFOR Guidelines for Foodborne Disease Outbreak Response describes the overarching functions and related activities that are common to most outbreak investigations. These functions include

- **Planning and Preparation** (**Chapter 3**),
- **Surveillance and Outbreak Detection** (**Chapter 4**),
- **Investigation of Clusters and Outbreaks** (**Chapter 5**), and
- **Control Measures** (**Chapter 6**).

The CIFOR Guidelines is not limited to one approach to performing these functions but provide a range of approaches with the rationale behind them. In this way, the Guidelines allows users to make practical decisions about their (or their agency's) response to an outbreak, including the order, magnitude, or necessity of the associated activities.

Because investigations that involve multiple agencies in different geographic locations or from different sectors are more complex, the CIFOR Guidelines provides special considerations for **Multijurisdictional Outbreaks** (**Chapter 7**). As a context for responding to foodborne outbreaks, the Guidelines also covers **Fundamental Concepts of Public Health Surveillance and Foodborne Disease** (**Chapter 2**) and **Legal Considerations for the Surveillance and Control of Foodborne Disease Outbreaks** (**Chapter 9**). Finally, to assist agencies in assessing their response to foodborne disease outbreaks, the Guidelines provides **Performance Indicators for Foodborne Disease Programs** (**Chapter 8**).

The following sections summarize the contents of Chapters 2 through 6, which provide key background information and cover all of the critical steps in detecting and responding to foodborne disease outbreaks. These summaries are intended to give a high level overview of each chapter, thus making it easier to find information of particular interest. The detailed information about each topic covered below can be found under the chapter and section numbers referenced in each paragraph.

Overview of Chapter 2. Fundamental Concepts of Public Health Surveillance and Foodborne Disease

Introduction (Section 2.0)

Preventing foodborne illness relies on our ability to translate the principles of food safety into the practices that occur at each step in the production of food. Foodborne illnesses and disease outbreaks, detected through public health surveillance, reflect what and how we eat

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and represent important sentinel events that signal a failure in the food-safety process.

Trends in Diet and the Food Industry (Section 2.1)

Dietary Changes (2.1.1)

The American diet has transformed significantly in recent years with the consumption of a broader variety of foods and increasing amounts of fruit, vegetables, and seafood. Culinary practices that use undercooked or raw foods have become popular. In addition, an increasing number of Americans eat their meals away from home.

Changes in Food Production (2.1.2)

The food industry has accommodated Americans' dietary demands by moving from locally grown and raised products to routine importation of out-of-season or exotic foods from other countries. Changes in technology and improved growing, harvesting, packaging, and transportation practices facilitate the importation of distantly grown, fragile foods.

The industrialization of food production has led to concentrated animal feeding operations and increasingly intense agricultural practices that can facilitate spread of disease and contamination of food products. Changes in agricultural processing or packaging can facilitate bacterial contamination or growth, and routine use of antibiotics to promote the growth of livestock and poultry has increased human infections caused by drug-resistant bacteria. The broadening distribution of foods has contributed to outbreaks of foodborne disease involving larger numbers of people, multiple states, and even multiple countries.

Trends in Food Product Recalls (2.1.3)

Food recalls are one indication of food-safety problems. During February 2007 through February 2008, the U.S. Department of Agriculture (USDA) and the federal Food and Drug Administration (FDA) reported more than 90 voluntary recalls of food associated with microbial contamination. Recalled products were distributed locally, nationally, or internationally and were sold in a variety of retail settings. Many recalls were for contaminated meat; however, other foods also were recalled. The contaminating pathogens most commonly identified in food recalls were *Listeria monocytogenes*, Shiga toxin-producing *Escherichia coli*, and *Salmonella* species, but products also were recalled that were contaminated with viruses, parasites, and toxins.

Trends in Surveillance (Section 2.2)

Overview (2.2.1)

Many surveillance systems are used in the United States to provide information about the occurrence of foodborne disease. Some focus on specific enteric pathogens likely to be transmitted through food and have been used extensively for decades. More recently, new surveillance methods have emerged (e.g., hazard surveillance, sentinel surveillance systems, and national laboratory networks). Each surveillance system plays a role in detecting and preventing foodborne disease and outbreaks.

Selected Surveillance Systems of Relevance to Foodborne Diseases (2.2.2)

Notifiable disease surveillance (2.2.2.1)

In notifiable disease surveillance, health-care providers and laboratorians are required by law to report individual cases of disease when selected pathogens are identified in patient specimens or specific clinical syndromes are recognized. Local public health agencies report these diseases to the state or territorial public health agency, which in turn submits the information to the National Notifiable Disease Surveillance System, which the Centers for Disease Control and Prevention (CDC) oversees.

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Notifiable disease surveillance is "passive" (i.e., the investigator waits for disease reports from those required to report) and is susceptible to diagnosis and reporting problems.

Foodborne disease complaints/notifications (2.2.2.2)
Foodborne Disease Complaint/Notification systems allow public health agencies to receive, triage, and respond to reports from the public about possible foodborne illnesses. The processing of complaints varies by agency. Most agencies collect some exposure information and record the complaint in a log book or on a standardized form. Regular review of these reports for trends or commonalities can identify foodborne illnesses in the community and possibly clusters of foodborne diseases.

Behavioral Risk Factor Surveillance System (2.2.2.3)
The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based telephone survey established by CDC that collects information about health risk behaviors, preventive health practices, and health-care access. BRFSS is not an appropriate system for detecting foodborne illness, but it can be used to identify behaviors (e.g., food handling practices and eating meals away from home) that can inform foodborne illness prevention efforts.

Hazard surveillance (2.2.2.4)
Factors that lead to the contamination of food with microorganisms or toxins or allow survival and growth of microorganisms in food (i.e., contributing factors) are used to develop control and intervention measures at food production and service facilities. Inspections of these facilities, often referred to as Hazard Analysis Critical Control Point (HACCP) inspections, are targeted at the implementation of these measures. Results of these inspections form the basis for hazard surveillance. Currently no national hazard surveillance system exists.

Contributing factor surveillance (2.2.2.5)
Investigators from state and local public health agencies gather information about contributing factors in foodborne outbreaks through environmental assessments conducted by food control officials and/or their own staff and report the results to CDC. Contributing factors cannot be identified through general inspections of operating procedures or sanitary conditions like those used for licensing or routine inspection of a restaurant but require a systematic description of what happened and how events most likely unfolded in an outbreak. Because many food control officials fail to adjust their day-to-day regulatory inspection process to conduct an environmental assessment, contributing factor data in outbreak investigations often are not adequately assessed.

CDC's Environmental Health Specialists Network (EHS-Net) was established in 2000 to address the environmental causes of foodborne disease. Participants include environmental health specialists and epidemiologists from nine states, the FDA, USDA, and CDC. Improving environmental assessments in foodborne outbreak investigations and reporting contributing factor and antecedent data to CDC is one of EHS-Net's primary research activities. CDC is exploring development of a surveillance system for contributing factors and antecedents from investigations of foodborne disease outbreaks.

Foodborne Diseases Active Surveillance System (FoodNet) (2.2.2.6)
FoodNet is a sentinel surveillance system undertaken at 10 participating sites in the United States in collaboration with CDC, USDA, and FDA. FoodNet concentrates on foodborne disease documented by laboratory testing and is an active surveillance system (i.e., investigators regularly contact laboratories to enhance reporting). FoodNet serves as a

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platform for a variety of epidemiologic studies and provides insights into the incidence of and trends in foodborne and diarrheal diseases.

National Molecular Subtyping Network for Foodborne Disease Surveillance (Pulse Net) (2.2.2.7)

PulseNet is a national network of local, state, territorial, and federal laboratories coordinated by CDC that perform pulsed-field gel electrophoresis (PFGE) on selected enteric pathogens using standardized methods. PulseNet allows investigators from participating sites to upload PFGE patterns to an electronic database and compare them with patterns of other pathogens isolated from humans, animals, and foods to identify matches and possible linkages between pathogens (e.g., outbreaks). PulseNet has vastly improved rapid detection of even relatively small foodborne disease outbreaks occurring in multiple sites across the country.

National Antimicrobial Resistance Monitoring System–Enteric Bacteria (NARMS) (2.2.2.8)

NARMS was developed to monitor antibiotic resistance patterns in selected bacteria found in people, animals, and meat products. NARMS data enable investigators to better understand the interaction between antibiotic use in livestock and antibiotic resistance in pathogens from animals and humans who ingest animal food products.

Foodborne Outbreak Reporting System (2.2.2.9)

CDC's Foodborne Outbreak Reporting System collects voluntary reports from public health agencies summarizing the results of foodborne outbreak investigations. This system has been modified and expanded over time. In 2001, reporting became Web-based in a system called the electronic Foodborne Outbreak Reporting System (eFORS). Starting in 2009, the system includes modules for reporting waterborne outbreaks and enteric disease outbreaks caused by person-to-person contact and by direct contact with animals and will be called the National Outbreak Reporting System.

Quality and Usefulness of Surveillance Data (2.2.3)

Surveillance statistics reflect only a fraction of cases that occur in the community. Incomplete diagnosis and reporting of foodborne illnesses inhibits surveillance and the detection of foodborne disease outbreaks (2.2.3.1). The specific data elements collected through surveillance and the validity and accuracy of the information collected further impact the usefulness of surveillance information (2.2.3.2).

Etiologic Agents Associated with Foodborne Diseases (Section 2.3)

Overview (2.3.1)

Foodborne illnesses have myriad causes including microorganisms (e.g., bacteria, viruses, parasites, and marine algae) and their toxins, mushroom toxins, fish toxins, heavy metals, pesticides, and other chemical contaminants. Human illness caused by these agents is often categorized into those caused by toxins present in food before it is ingested (preformed toxins) or those caused by multiplication of the pathogen in the host and damage from toxins produced within the host or invasion of host cells (infection).

Patterns in Etiologic Agents Associated with Foodborne Disease Outbreaks (2.3.2)

On the basis of reports to eFORS from 1998 to 2002, bacteria (including their toxins) accounted for 55% of foodborne disease outbreaks for which an etiologic agent was determined. Viruses accounted for 33% of these outbreaks but increased from 16% in 1998 to 42% in 2002 probably because of the increased availability of methods to diagnose viral agents. Marine algae, fish, and mushroom toxins and other chemicals accounted for 10% of outbreaks for which a cause was known.

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Because no etiologic agent is identified for a large proportion of foodborne outbreaks and not all outbreaks are detected, investigated, and reported through eFORS, the relative frequency of various etiologic agents based on eFORS or similar data should be interpreted with caution.

Determining the Etiologic Agent in an Outbreak (2.3.3)

Laboratory testing of clinical specimens from patients is critical in determining the etiology of a foodborne disease outbreak. For most foodborne diseases, stool is the specimen of choice. In an outbreak, specimens are collected as soon as possible after onset of symptoms from at least 10 individuals who manifest illness typical of the outbreak and have not received antibiotics.

Isolation of the etiologic agent from food is more challenging because certain pathogens require special collection and testing techniques. In addition, food samples collected during the investigation might not reflect foods eaten at the time of the outbreak. As a result, food testing results should be interpreted with caution (2.3.3.1).

Predominant signs and symptoms, and the average incubation period, can provide insights into the etiologic agent. Illnesses resulting from preformed toxins manifest rapidly, often in a matter of minutes or hours. The most common symptom is vomiting, although other symptoms occur depending on the agent. Illnesses caused by infections take longer to manifest, ranging from hours to days or weeks. Symptoms usually include diarrhea, nausea, vomiting, and abdominal cramps. Fever and an elevated white blood cell count also can occur.

Because certain pathogens are commonly associated with certain foods, the suspected food in an outbreak can suggest a particular disease agent. However, most foods can be associated with a variety of pathogens and new vehicles emerge each year, so care must be taken in inferring an etiologic agent on the basis of a suspected food (2.3.3.2.2).

Mode of Transmission (2.3.4)

Many agents responsible for foodborne illness can be transmitted by other routes (e.g., water, person to person, and animal to person). Early in the investigation of a potential foodborne disease outbreak, investigators should consider all potential sources of transmission.

Occasionally case characteristics suggest one mode of transmission over others in an outbreak.

- Foodborne transmission is suggested by cases with distinctive demographic characteristics (i.e., age group, sex, and ethnicity) that could reflect unique food preferences or exposures and cases with a geographic distribution similar to the distribution of food products.
- Waterborne transmission should be considered if illness is widespread, both sexes and all age groups are affected, the geographic distribution of cases is consistent with public water distribution, complaints about water quality in the affected community have been reported, or multiple pathogens are involved.
- Person-to-person transmission should be suspected when cases cluster in social units (e.g., families, schools, dorms or dorm rooms) and when cases occur in waves separated by approximately one incubation period of the disease agent.

Overview of Chapter 3. Planning and Preparation

Good planning and preparation will help investigators identify the source of an outbreak more quickly and implement control measures more efficiently and effectively. Planning and preparation activities are far-reaching and include

- Identification of the agencies likely to be involved in an outbreak investigation and their available resources (Section 3.1);
- Establishment and training of a core outbreak response team (Section 3.2),
- Identification of necessary resources (Section 3.3);
- Development of standard processes for receiving foodborne illness complaints (Section 3.4), managing records (Section 3.5), communication (Section 3.6), escalation to involve other agencies (Section 3.9), and recovery and follow-up after an outbreak (Section 3.7); and
- Assurance of legal preparedness (Section 3.8).

Agencies likely to be involved in an outbreak response also should decide in advance whether and how to apply an Incident Command System in the event of an outbreak (Section 3.10).

Agency Roles (Section 3.1)

A foodborne disease outbreak can be managed solely by a single local health agency or become the shared responsibility of multiple local, state, and federal agencies. The agencies involved will depend on the nature of the outbreak (e.g., type of pathogen, suspected or implicated vehicle, number of individuals affected) and the resources necessary to address it.

The following local, state, and federal agencies have access to different resources and can contribute to outbreak response efforts in different ways:

- Local health agencies (3.1.2.1),
- State health departments (3.1.2.2),
- State environmental conservation or quality agencies (3.1.2.3),
- State agriculture departments (3.1.2.4),
- CDC (3.1.2.5),
- FDA (3.1.2.6), and
- USDA/FSIS (3.1.2.7).

If an outbreak occurs in a facility or community managed by an agency that has some level of autonomy or operates its own public health program, other agencies might be involved in an investigation or take the lead, such as a tribal organization (3.1.3.1), military agency (3.1.3.2), or National Park Service unit (3.1.3.3). In addition, food manufacturers, distributors, retailers, and trade associations can provide knowledge and information about product identities, formulations, processing practices, and distribution patterns and are key to outbreak investigation and implementation of control measures (3.1.4).

Outbreak Investigation and Control Team (Section 3.2)

Typically, the responsibility for conducting a foodborne outbreak investigation, recommending control measures, and monitoring their implementation falls on a core team of individuals.

The composition of the core team should be determined before an outbreak occurs and should include individuals with knowledge and skills to address the responsibilities common to most outbreaks, such as

- Team leader (3.2.2.1),
- Epidemiologic investigator (3.2.2.2),
- Environmental investigator (3.2.2.3),
- Laboratory investigator (3.2.2.4), and
- Public information officer (3.2.2.5).

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Depending on the unique characteristics of the disease or the outbreak, individuals with other expertise may be needed in an outbreak investigation. Such individuals might include statisticians, health educators, and health-care providers; however, those specific needs probably cannot be anticipated before an outbreak occurs (3.2.2.6).

Outbreak Investigation and Control Teams—Model Practices (3.2.3)

Outbreak response team members should work closely together, not in isolation. Because the work of one team member often builds on that of another team member, good communication among team members and timely sharing of pertinent information is critical. In addition, implementation of the following practices will improve the effectiveness of the team:

Emergency response unit (3.2.3.1)

If population size and number of outbreaks warrant it, an emergency response unit consisting of senior epidemiologists, environmental scientists, and laboratorians that train and work together in response to all outbreaks should be established.

Additional support for large-scale outbreaks (3.2.3.2)

Because some outbreaks are too large for a single agency to manage, health departments should identify individuals outside the agency who would be willing and able to provide support during a large-scale outbreak (e.g., staff from other branches of government, university students, and Medical Reserve Corp volunteers).

Agency-specific response protocol and other resources (3.2.3.3)

The outbreak response team should have pre-identified protocols for outbreak investigation and access to resources that allow them to answer questions and make decisions during an outbreak. A list of people inside and outside the agency who should be contacted in the event of an outbreak should be prepared and updated regularly.

Training for the team (3.2.3.4)

Team members should be trained in the agency's outbreak response protocols and their role on the team. Training can be provided through established classroom and self-study courses but is likely to be more effective when interesting and provided through team and interagency exercises, on-the-job training during a real-life investigation, and debriefings after each outbreak investigation.

Resources (Section 3.3)

To ensure a rapid response to an outbreak, health departments should assemble (and learn to use) resources necessary for an investigation before an outbreak occurs. Recommended resources include

- Support personnel to make phone calls, answer calls, and enter data (3.3.2.1),
- Legal counsel (3.3.2.2),
- Equipment (3.3.2.3),
- Supplies (3.3.2.4),
- Outbreak investigation documents (3.3.2.5), and
- Reference materials (3.3.2.6).

Procedures for routinely reviewing and replacing missing or outdated supplies, equipment, and reference materials should be part of an agency's outbreak response protocol.

Complaint Processing (Section 3.4)

A process, including a standard data collection form, should be established to receive complaints of potential foodborne illnesses from the public. Use of an enteric illness log or database to track all illness complaints and designation of one person to process or review all complaints will increase the likelihood of identifying patterns and possible outbreaks.

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Records Management (Section 3.5)

Before an outbreak occurs, procedures for records management should be established, including use of standard forms for collecting and organizing outbreak information, development of database templates, and identification of tools to analyze outbreak data to ensure speedy analysis of investigation results. Staff should be trained in the use of these items. Policies for sharing information between members of the investigation team (and their associated agencies) and facilities implicated in an outbreak also should be established.

Communication (Section 3.6)

Good communication is critical throughout the investigation of a foodborne disease outbreak. Agencies should develop methods for communication with individuals and organizations key to an investigation before an outbreak occurs (3.6.2.1). Key individuals and organizations include the following:

- The outbreak investigation team and involved agencies (3.6.2.2);
- Other local, state, and federal authorities (3.6.2.3);
- Local organizations, food industry, and other professional groups (3.6.2.4);
- The public (3.6.2.5);
- Cases and family members (3.6.2.6); and
- The media (3.6.2.7).

Processes for communicating with these individuals and organizations should include routinely updated contact lists (where appropriate) and standard channels of communication so that each knows who to communicate with and where the information will come from during an outbreak.

Recovery and Follow-up (Section 3.7)

Agencies should establish protocols for actions that must be taken or results that must be achieved before an implicated facility or food source can return to normal operations and develop methods to monitor those facilities. Agencies should establish a process for creating after-action reports following investigations, with lessons learned and action items for follow-up and quality improvement.

Legal Preparedness (Section 3.8)

Legal preparedness is the foundation for an effective outbreak response effort. The following items will ensure legal preparedness: a) laws and legal authorities needed to support surveillance, detection, investigation, and control activities; b) professional staff who understand and are competent in using their legal authorities; c) memoranda of agreement and other legal agreements for coordinated implementation of laws across jurisdictions and sectors; and d) information about best practices in using law for outbreak response.

Escalation (Section 3.9)

If an outbreak affects multiple jurisdictions or is likely to exceed the resources or expertise of a particular agency, investigators should escalate the investigation and involve other agencies as soon as the need is suspected. Investigators from local health departments should notify their state program. Investigators from the state health department should notify CDC and the appropriate food-regulatory agency.

Incident Command System (Section 3.10)

An Incident Command System (ICS) is a structure that provides for internal communications within a government system among primary event responders, public information officers, and security and safety officers and for external liaison with various

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organizations. ICS is designed to enable effective, efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure. The role of an ICS response in an outbreak investigation varies and is not without controversy, with some agencies using an ICS structure while others do not. Agencies involved in foodborne outbreak investigation and response should decide in advance whether and how to apply an ICS and, if applicable, incorporate the ICS structure into their response planning.

Overview of Chapter 4. Foodborne Disease Surveillance and Outbreak Detection

Foodborne disease surveillance generally refers to the routine monitoring in a population of enteric diseases potentially transmitted through food. Foodborne disease surveillance serves many functions, including detection of disease clusters and problems in food production or delivery.

Three general surveillance methods are used to detect foodborne disease outbreaks:

- Pathogen-specific surveillance (Section 4.2)
- Notification/complaint systems (Section 4.3)
- Syndromic surveillance (Section 4.4)

Pathogen-Specific Surveillance (Section 4.2)

In pathogen-specific surveillance, health-care providers and laboratorians report individual cases of disease to the public health agency when certain pathogens are identified in patient specimens or specific clinical syndromes are recognized (e.g., hemolytic uremic syndrome and botulism). In addition, clinical laboratories forward selected patient isolates or other clinical material to public health laboratories.

Staff from the public health agency may interview reported cases one or more times to collect clinical, demographic, and exposure information. The scope of these interviews varies by jurisdiction and can include routine collection of detailed exposure information at the time of initial report. The causative agent, onset of illness, location of the case, and exposures are examined to identify disease trends and clusters. Clusters are examined as a group and, if a common exposure seems likely, investigated as a potential outbreak (4.2.4).

The public health laboratory confirms the disease agent and conducts tests (e.g., serotyping, molecular subtyping, or antimicrobial susceptibility assays) to further characterize the agent. Laboratory data are uploaded to national systems, such as PulseNet. Except for individual cases of botulism, and occasionally other infections, testing of food or other environmental specimens related to cases is not advised without strong epidemiologic or environmental information implicating the item (4.2.5).

Strengths of Pathogen-Specific Surveillance for Outbreak Detection (4.2.7)

Strengths of pathogen-specific surveillance in outbreak detection largely relate to the specificity with which disease agents are classified and include the

- Ability to detect widespread disease clusters initially linked only by a common agent and
- High sensitivity for detecting unforeseen problems in our food and water supply systems.

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Limitations of Pathogen-Specific Surveillance (4.2.8)

The limitations of pathogen-specific surveillance include

- Inclusion of only diseases detected by routine testing and reported to the public health agency and
- Delay in cluster detection and follow-up due to events that must occur between the time a patient is infected and the time he or she is recognized as part of a cluster.

Key Determinants of Successful Pathogen-Specific Surveillance (4.2.9)

If the percentage of cases detected through pathogen-specific surveillance is low (i.e., low sensitivity), small outbreaks or outbreaks spread over space and time are more likely to be missed. In addition, reported cases might differ significantly from those not reported, resulting in a mischaracterization of an outbreak (4.2.9.1).

The more prevalent a disease is in the community, the more difficult outbreaks of that disease are to identify and the more difficult background cases are to distinguish from outbreak cases. Increasing the specificity of the case definition by including more specific agent classifications (e.g., subtype results) or certain time, place, or person characteristics among cases can minimize this problem (4.2.9.2)

For cases detected through pathogen-specific surveillance, consider potential exposures within the usual incubation period of the disease. Interviews to detect these exposures should be undertaken as soon possible and include a mixture of questions, as appropriate circumstances, that

- Ask about specific exposures previously (or plausibly) associated with the pathogen,
- Specifically ask about a wide variety of potential exposures,
- Prompt cases to describe common exposures in greater detail (e.g., provide brand information and place of purchase), and
- Enable cases to identify unanticipated exposures (i.e., exposures not previously associated with the pathogen) (4.2.9.3).

The usefulness of pathogen-specific surveillance in preventing ongoing transmission of disease from contaminated food is directly related to the speed of the surveillance and investigation process. Processes that decrease the time between infection of the patient and determination that the patient is part of a disease cluster increases the success of pathogen-specific surveillance (4.2.9.4).

Routine Surveillance — Model Practices (4.2.10)

Practices used by an agency vary and depend on a host of factors (e.g., circumstances specific to a specific cluster or outbreak, staff expertise, agency structure, and resources). The following model practices should be considered to improve pathogen-specific surveillance:

- Encourage health-care providers to test patient specimens as part of the routine diagnostic process for possible foodborne diseases (4.2.10.1).
- Increase reporting and isolate submission by clinical laboratories and health-care providers through education, modification of reporting rules, laboratory audits, and simplification of the reporting process (4.2.10.1).
- Minimize delays in processing reports and transporting specimens.
- Undertake subtyping of isolates as specimens are submitted and post results to national databases as quickly as possible (4.2.10.2).

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- Interview cases using a standardized questionnaire for exposure information (consistent with the incubation period of the pathogen) as soon as possible. Collection of detailed exposure information as cases are reported can help evaluate clusters in real time but is resource intensive. At a minimum, collect information about limited high-risk exposures specific to the pathogen at the time of the initial report and re-interview cases with a detailed exposure questionnaire if a cluster becomes apparent (4.2.10.3).
- To identify clusters, use daily, automated reporting and analysis systems to compare disease agent frequencies at multiple levels of specificity with historical frequencies and national trends (4.2.10.4).
- Establish and use routine procedures for communicating among epidemiology, laboratory, and environmental health branches within an agency and among local, state, and federal agencies (4.2.10.5).

Notification/Complaint Systems (Section 4.3)

In notification/complaint systems, public health agencies receive, triage, and respond to reports from the public about possible foodborne illnesses. Reporting is passive and falls into two basic categories:

- Reports from an individual or group who observes a pattern of illness affecting a group of people, usually following a common exposure (e.g., event or venue) and
- Multiple independent reports about illness in single individuals.

Health-care provider reports of unusual disease clusters are triaged; occurrence of the same disease is confirmed; cases are interviewed; data are analyzed; and investigations are initiated.

For reports of group illness associated with an event or venue, the investigation generally involves obtaining lists of attendees, confirming ill persons have the same disease, obtaining menus from the event (and other possible group exposures), interviewing cases, performing a cohort or case-control study, and collecting food and patient specimens.

With independent complaints, individuals are interviewed about their illness and exposures at the time of the report. Exposure information generally is limited and biased toward exposures shortly before onset of symptoms. In the absence of common, suspicious exposures shared by two or more cases, independent complaints of illness with nonspecific symptoms (e.g., diarrhea or vomiting) generally are not worth pursuing unless required by local or state statute.

Strengths of Notification/Complaint Systems for Outbreak Detection (4.3.6)

The primary strengths of notification/complaint systems result from their lack of dependence on health-care system contact and laboratory testing. These strengths include

- Ability to detect outbreaks from any cause, known or unknown, and
- Increased speed of detection.

For event-related notifications, another strength is that exposures associated with the event can normally be determined and recall of exposures among attendees is usually good.

Limitations of Notification/Complaint Systems (4.3.7)

Lack of detailed exposure information and specific agent or disease information limits notification/complaint systems, resulting in the following:

- Inability to link related cases and exclude unrelated cases,

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- Inability to detect widespread low-level contamination events, and
- Detection primarily of outbreaks resulting from illnesses of short incubation (i.e., chemical or toxin-mediated) or with unique symptoms.

Key Determinants of Successful Notification/Complaint Systems (4.3.8)

Detection of outbreaks by notification of group illness is limited by the severity of the illness, public awareness of where to report the illness, ease and availability of the reporting process, and investigation resources. Detection of outbreaks from independent complaints is influenced by these factors and by the number of cases reported, the interview process, the uniqueness of the illness or reported exposure, and methods used to evaluate reports (4.3.8.1).

When an outbreak associated with a group event is reported, some group members may be ill for reasons other than a group exposure. Inclusion of these cases in the analyses hinders detection of associations between exposures and disease. The likelihood of this occurring depends on the nature of the symptoms and their background prevalence. Identification of a specific disease agent or increasing the specificity of symptom information (e.g., bloody diarrhea or specific duration of illness) can minimize this problem (4.3.8.2).

Because exposures associated with group events are limited and can be described specifically, patient recall and timing are less of an issue than with pathogen-specific surveillance or independent complaints. Nonetheless, the more specific exposure-related questions are during case interviews, the better recall will be. Interviewing food-preparation staff or event organizers before cases can help (4.3.8.3).

When individual exposure histories are collected for independent complaints or group illnesses, potential exposures are broad-ranging and difficult to recall. The problem may be even greater than in pathogen-specific surveillance because no causative agent has been identified that would allow investigators to focus on exposures previously associated with that pathogen. Hence, interviews must be done promptly and systematically to be effective (4.3.8.3).

Notification/Complaint Systems — Model Practices (4.3.9)

Multiple factors influence an agency's response to a notification or complaint. The following model practices should be considered to improve notification/complaint systems:

- For group illnesses associated with an event, focus interviews on shared exposures with the realization that the individuals within the group might have more than one event in common (4.3.9.1).
- For group illnesses, obtain clinical and food specimens. Collect and store food samples, but generally test food only after epidemiologic implication (4.3.9.4).
- For group illnesses, establish an etiology to enable implementation of rational interventions and allow linkages with other outbreaks or sporadic cases (4.3.9.5).
- For individual complaints, collect a detailed 5-day exposure history (unless otherwise indicated by the incubation period of the illness) using a standardized form that covers both food and nonfood exposures and record exposure information in a way that facilitates comparisons with histories reported by other individuals (4.3.9.2).
- Review interview data regularly to look for trends or commonalities and compare with information obtained through pathogen-specific surveillance (4.3.9.6),

Overview of Chapter 4. Foodborne Disease Surveillance and Outbreak Detection

- Improve interagency cooperation and communication among agencies that receive illness complaints (4.3.9.7 and 4.3.9.12).
- Check complaint information against national databases (e.g., USDA/FSIS Consumer Complaint Monitoring System) (4.3.9.12).
- Improve reporting from the public by simplifying the reporting process (4.3.9.9) and increasing public awareness to report (4.3.9.10).Train food managers and workers about the importance of reporting unusual patterns of illness among workers or customers and food code requirements for disease reporting.
- Centralize reporting or the process for reviewing reports to increase the likelihood that patterns are detected (4.3.9.11).

Syndromic Surveillance (Section 4.4)

Syndromic surveillance involves the systematic (usually automated) gathering of data on nonspecific health indicators that may reflect increased disease occurrence. Syndromic surveillance typically relies on the following types of information:

- Preclinical information, which does not depend on access to health-care (e.g., school and work absenteeism, sales of over-the-counter drugs, calls to poison control centers);
- Clinical prediagnostic information, which requires contact with the health-care system but not definitive diagnosis or reporting (e.g., emergency department chief complaints, ambulance dispatches, and lab test orders); and
- Postdiagnostic data, which requires contact with the health-care system and some degree of diagnosis (e.g., hospital discharge codes).

In syndromic surveillance, increases in specific indicator signals are evaluated. If the increase is determined likely to represent a true outbreak, exposure information is collected through interviews of individual cases (4.4.4)

Strengths of Syndromic Surveillance (4.4.6)

In theory, syndromic surveillance offers increased speed in outbreak detection; the ability to detect outbreaks from any cause, known or unknown, diagnosed or not; and reduced dependence on individuals because of automated reporting.

Limitations of Syndromic Surveillance (4.4.7)

Syndromic surveillance has serious limitations, including numerous false-positive signals caused by the lack of specificity of indicators, reliance on routine surveillance to evaluate signals, lack of exposure information, and substantial costs for system development. In addition, in response to concerns about patient confidentiality, many agencies collect only de-identified data, which slows the investigation of positive signals from the system.

Key Determinants of Successful Syndromic Surveillance Systems (4.4.8)

The key determinants of successful syndromic surveillance are the specificity of the indicators and speed of detection, factors that are inversely proportional. Less specific indicators mean that more cases are needed to overcome background noise and that false-positive alerts are likely. More specific signals decrease these problems but do not offer any time advantage over other forms of surveillance.

Practices for Improving Syndromic Surveillance (4.4.9)

Because the utility of syndromic surveillance for detecting foodborne disease events has not been established, the need for additional investment is not clear. To improve a syndromic surveillance system, however, it might be useful to integrate the system with standard surveillance systems and corroborate findings using data from multiple sources. Fine-tuning algorithms used to signal an alert also might reduce false-positive signals.

Overview of Chapter 5. Investigation of Clusters and Outbreaks

Introduction (Section 5.0)

An outbreak is the occurrence of two or more cases of a similar illness shown by an investigation to result from a common exposure. Outbreaks identified through pathogen-specific surveillance are initially recognized as clusters of cases defined by pathogen subtype characteristics. The distribution of these cases by time, space, and personal characteristics provide clues about whether the cases are likely to represent an outbreak from a common source of exposure. Only a systematic investigation can confirm whether the cluster actually is an outbreak.

Because many agents transmitted by food also can be transmitted by water and from person to person, animal to person, or other mechanisms, when a potential foodborne disease outbreak is detected, investigators must keep an open mind and not rule out other causes prematurely.

Characteristics of Outbreak Investigations (Section 5.1)

Importance of Speed and Accuracy (5.1.1)

Speed and accuracy are the two key ingredients of all outbreak investigations. One cannot be sacrificed for the other. Speed and accuracy can help public health officials

- Stop an outbreak quickly and prevent additional illnesses;
- Prevent future outbreaks by identifying the circumstances that led to the current outbreak;
- Identify new hazards, including new agents, new food vehicles, new agent–food interactions, and other unsuspected gaps in the food-safety system;
- Maintain the public's confidence in the food supply and in the public health system; and
- Empower the public to protect itself from food-safety problems.

Principles of Investigation (5.1.2)

Although general principles underlie successful investigations, no one specific method works best in all situations. Investigators need to be flexible and innovative and undertake activities in a thoughtful and systematic manner.

Leadership of an investigation should reflect the focus of investigation activities and may shift among laboratory studies; epidemiologic studies; regulatory investigations of food-production sources and distribution chains; environmental evaluations of food production, processing, and service facilities; and communication of investigation findings to support control and prevention measures (5.1.2.2).

Investigations are rarely linear. Although most procedures for investigating outbreaks follow a logical process, most actual investigations feature multiple concurrent steps. Maintaining close communication and coordination among epidemiologic, environmental health, and laboratory investigators is the best way to ensure concurrent activities do not interfere with each other and important investigation steps are not forgotten (5.1.2.3).

Hypothesis generation should begin early in an outbreak investigation to narrow the focus of the investigation and use time and resources most effectively. As more information is obtained, hypotheses can be modified. Key steps in hypothesis generation include the following:

- Reviewing previously identified risk factors and exposures for the disease;
- Examining the descriptive epidemiology of cases to identify person, place, or time characteristics that might suggest particularly likely exposures; and
- Interviewing in detail the affected persons or a sample of affected persons to identify

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unusual exposures or commonalities among cases (5.1.2.4).

The use of standardized forms for collecting information (e.g., exposure histories from cases, environmental health assessment information) ensures that pertinent information is not overlooked and enables investigators to become proficient with the forms, saving time during an investigation (5.1.2.5). The use of standardized "core" questions and data elements facilitates data sharing and comparisons across jurisdictions.

All outbreak investigations involve collection of private information that must be protected from public disclosure to the extent allowed by law. Investigators need to be familiar with relevant state and federal laws and practices, including the Health Insurance Portability and Accountability Act (HIPAA) (5.1.2.6).

Cluster and Outbreak Investigation Procedures (Section 5.2)

Conduct a Preliminary Investigation (5.2.1)

Foodborne disease outbreaks typically are detected through three general methods: pathogen-specific surveillance, notification/complaint systems, and syndromic surveillance (5.1.2.1). After detection, a preliminary investigation should be undertaken to determine whether the reported illnesses may be part of an outbreak.

- For complaints of group illness attributed to a particular event or establishment, multiple cases with similar symptoms and an incubation period consistent with the timing of the reported exposure are suggestive of an outbreak (5.2.1.1).
- For case clusters identified through pathogen-specific surveillance, cases (defined by subtype characteristics) clearly in excess of the expected number and demographic features or known exposures of cases suggestive of a common source are clues that the cluster might represent an outbreak (5.2.1.2).

Assemble the Outbreak Investigation and Control Team (5.2.2)

Outbreak investigation and control team leaders should be alerted as soon as a potential outbreak is identified *(5.2.2.1)*. After reviewing the descriptive features of the outbreak and relevant background information, team leaders should assess the priority of investigating the outbreak. Highest priority is typically given to outbreaks that have a high public health impact; are ongoing; or appear to be associated with a food-service establishment, commercially distributed food product, or adulterated food *(5.2.2.2)*.

Team leaders then should assess the availability of sufficient staff to conduct the investigation, particularly to interview cases quickly and solicit controls, as needed. If sufficient staff are not available, team leaders should request external assistance *(5.2.2.3)*.

The outbreak investigation and control team should be assembled and briefed about the outbreak, the members of the team, and their individual roles in the investigation. For outbreaks involving multiple jurisdictions, the outbreak investigation and control team should include members from all agencies participating in the investigation (5.2.2.3).

Establish Goals and Objectives for the Investigation (5.2.3)

The outbreak investigation and control team should establish goals and objectives for the investigation. The primary goals of most investigations are to implement interventions to stop the outbreak and prevent similar outbreaks. To achieve these goals, the outbreak investigation and control team will need to

- Identify the etiologic agent,

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- Identify persons at risk,
- Identify mode of transmission and vehicle,
- Identify the source of contamination,
- Identify contributing factors, and
- Determine potential for ongoing transmission and need for abatement procedures.

Select and Assign Investigation Activities (5.2.4)

Epidemiologic, environmental health, and public health laboratory activities that support these objectives should be assigned to outbreak investigation and control team members. These activities will differ depending on the specifics of the outbreak and whether the outbreak is associated with an event (or establishment) (Table 5.1) or was identified through pathogen-specific surveillance (Table 5.2).

Cluster investigation—model practices (5.2.4.1)

The practices used by an agency to investigate a cluster vary on the basis of a host of factors. The following practices should be considered to improve cluster investigation:

- Interview cases involved in a cluster as soon as possible and use interview techniques (e.g., reviewing cash register receipts or looking at a calendar and reconstructing recent events) that encourage recall of exposures (5.2.4.1.1).
- Use a dynamic cluster investigation process to generate hypotheses (5.2.4.1.2). In this model, initial cases in a recognized cluster are interviewed with a detailed exposure history questionnaire. As new suspicious exposures are suggested during the interviews (i.e., are reported among 5-10 cases), initial cases are systematically re-interviewed to uniformly assess their exposure and the suspicious exposure is added to the interview of subsequently identified cases.
    - For agencies that routinely interview ALL cases with a detailed exposure questionnaire, dynamic cluster investigation can be initiated as soon as a cluster is recognized. Such an approach results in improved recall because cases are more likely to remember exposures when specifically questioned about them. The approach also is more likely to result in a meaningful intervention because of the compressed time frame of the investigation (5.2.4.1.2).
    - For agencies that do not have sufficient resources to conduct detailed exposure history interviews for every case, a two-step interviewing process may be the best alternative approach. All cases are interviewed to collect information about a limited set of "high-risk" exposures specific to the pathogen. When a cluster becomes apparent, all cases in the cluster are then interviewed using a detailed exposure questionnaire following the "dynamic cluster investigation" approach (5.2.4.1.2.2).
    - For agencies that do not have sufficient resources to conduct detailed interviews with all cases in a cluster, hypothesis-generating interviews can be undertaken with a subset of cases after a cluster becomes obvious. Exposures reported by a substantial proportion of these cases can then be studied (5.2.4.1.3).
- Use the FoodNet Atlas of Exposures for an initial evaluation of shared exposures among cases. The Atlas includes information about exposures that might be associated with foodborne illnesses and can be used as a crude estimate of the background rate of different food exposures in the community. In the absence of survey data, common-sense estimates of the prevalence of a given exposure can help identify exposures of interest (5.2.4.1.4).

Overview of Chapter 5. Investigation of Clusters and Outbreaks

- Conduct an environmental health assessment of implicated facilities. An environmental health assessment differs from a general, routine inspection used for licensing a restaurant or food-production facility. It focuses on the problem at hand and considers how the disease agent, host factors, and environmental conditions interacted to result in the problem (5.2.4.1.5). The specific activities included in an environmental health assessment differ by disease agent, suspected vehicle, and setting but usually include the following:
  - Describing the implicated food,
  - Observing procedures to make food,
  - Talking with food workers and managers,
  - Taking measurements,
  - Collecting food and other environmental samples,
  - Collecting and reviewing documents on the source of food (e.g., invoices), and
  - Drawing a food flow diagram showing each step in the production of the food item.
- Conduct informational tracebacks/traceforwards of food items under investigation. Tracing implicated food items or ingredients through the distribution chain to the source of production can help identify epidemiologic links among cases. The convergence of food items eaten by multiple cases along a distribution pathway can help identify the source of contamination. Conversely, the failure to identify common suppliers among suspected foods eaten by different cases might indicate that the food item is not the vehicle for the outbreak (5.2.4.1.6).

Coordinate Investigation Activities (5.2.5)

The outbreak investigation and control team should meet daily and regularly update others involved in the investigation. If the outbreak has gained public attention, the public information officer needs to prepare a daily update for the media.

Close communication and collaboration among epidemiology, environmental health, and public health laboratory are necessary to ensure concurrent activities do not interfere with each other and to guide the activities of individual investigators. The public health laboratory needs to immediately forward new case information to epidemiologists. As epidemiologists interview cases about exposures in restaurants and other licensed facilities, they should rapidly forward that information to environmental health specialists. Environmental health specialists should share results of interviews with food workers and reviews of food-preparation that indicate important differences in exposure potential that should be distinguished in interviews of cases.

Compile Results and Reevaluate Goals for Investigation (5.2.6)

Document and compile results of each outbreak investigation in a manner that allows comparison with the original goals for the investigation. Demonstrate how each goal was achieved or, if the goal was not achieved, explain why. Novel questions or opportunities to address fundamental questions about foodborne disease transmission can develop during an investigation. The opportunity to address these issues might require reevaluation of the investigation's goals.

Development of an epidemic curve that is regularly updated can help depict the course of an outbreak and provide insight to disease transmission and relationships to notable events.

Interpreting Results (5.2.7)

The outbreak investigator must use *all* available information to construct a coherent

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narrative of what happened and why. Results of epidemiologic studies must be integrated with results of informational product tracebacks, food worker interviews, environmental health assessments, and food product and environmental testing.

In this process, investigators should consider their data critically. Statistical associations between exposure and illness may reflect a causal link but may also reflect confounding, bias, chance, and other factors. Conversely, failure to achieve a statistically significant association between illness and exposure may result from small sample size, contamination of multiple vehicles or unrecognized ingredient, or high background rates of exposure.

Investigators should be wary of explanations that depend upon implausible scenarios. Minor inconsistencies are common and may be ignored, but large numbers of inconsistencies might indicate that alternate hypotheses need to be considered.

Conduct a Debriefing at End of Investigation (5.2.8)

Encourage a postoutbreak meeting among investigators to assess lessons learned and compare notes on final findings. This is particularly important for multiagency investigations but also is important for single agency investigations.

Summarize Investigation Findings, Conclusions, and Recommendations (5.2.9)

At a minimum, every outbreak investigation should be documented using a standardized form to facilitate inclusion in state and national outbreak databases (e.g., CDC's form 52.13 or its equivalent). Investigators are encouraged to submit preliminary reports while the investigation is ongoing to help link outbreaks occurring in multiple places at the same time and facilitate further investigation. Larger or more complex investigations or investigations with significance for public health and food-safety practice demand a more complete report and, potentially, publication in a peer-reviewed journal.

Distribute Report (5.2.10)

Copies of the report should be shared with all persons involved with the investigation, (e.g., investigation team members, health department officials and press officers, health-care providers who reported cases) and distributed to persons responsible for implementing control measures (e.g., owners and managers of establishments identified as the source of the outbreak and program staff who might oversee implementation of control measures or provide technical assistance). The report is a public record and should be made available to members of the public who request it.

Overview of Chapter 6. Control Measures

Introduction (Section 6.0)

To prevent further illness in an outbreak, control measures should be initiated as soon as possible, even concurrently with ongoing investigations. However, the quality of information about which control measures are based as well as the potential positive and negative consequences of undertaking the control measures (or not undertaking control measures) should be kept in mind.

Control measures can be categorized as those that control the source (i.e., prevent continued exposure to the original source of the foodborne illness [Section 6.2]) and those that prevent secondary transmission (i.e., transmission from persons infected through the

Overview of Chapter 6. Control Measures

original source to others through food, water, or person-to-person transmission [Section 6.3]). Additional measures might be necessary to prevent future outbreaks (Section 6.8).

Control of the Source (Section 6.2)

Nonspecific Control Measures (6.2.1)

Nonspecific control measures (e.g., holding of leftovers, emphasizing hand-washing, excluding any ill employees) can be implemented as soon as a facility has been implicated in an outbreak, even though a specific food or causative agent has not been identified. Nonspecific control measures are good public health practice and are generally effective, regardless of the disease.

Specific Control Measures (6.2.2)

When a food has been implicated, control measures directed at the specific cause can be implemented. Specific control measures will vary depending on whether the implicated food is associated with food-service establishment or home processing (6.2.2.1) or is associated with a processor or producer as evidenced by its occurrence at multiple facilities or multiple locations (6.2.2.2).

Food associated with food-service establishments or home processing (6.2.2.1)

Specific control measures include

- Removing the implicated food from consumption (6.2.2.1.1),
- Cleaning and sanitizing the implicated facility and equipment (6.2.2.1.2),
- Training staff on general safe food-preparation practices and practices specific to controlling the causative agent (6.2.2.1.3),
- Modifying food production or preparation at the facility to prevent further contamination of food or survival and growth of microbes already present in food (6.2.2.1.4),
- Eliminating the implicated foods from the menu until it is certain that control measures are in place (6.2.2.1.5),
- Removal of infected food workers (6.2.2.1.6), and
- Closure of the facility and an outline of actions necessary for the facility to reopen (6.2.2.1.7).

Food associated with a processor/producer (6.2.2.2)

If multiple facilities are involved in an outbreak or the outbreak is associated with a product distributed to multiple locations, the above control measures might still be appropriate; however, efforts also might be needed to recall the implicated food from the market (6.2.2.2.1). The decision to recall a food is based on the strength of the evidence linking the food to illness and the ongoing risk for exposure among consumers (i.e., the likelihood that the food is still on the market or is in the homes of consumers).

Product recall (6.2.2.2)

If evidence supports the recall of a food (6.2.2.2.1), the appropriate agency should contact the manufacturer or distributor immediately and get its cooperation. The manufacturer or distributor might decide to issue a voluntary food recall that will include removal of food from distribution and market shelves and notification of customers and the public through regulatory agencies and the media. While awaiting the manufacturer's decision about a recall, it might be appropriate to directly ask retailers and distributors to voluntarily remove the product from their shelves and withhold the product from distribution.

Removal of food from market (6.2.2.2)

Removal of food from the market goes more smoothly if certain steps are undertaken by industry, retail establishments, and public health agencies before a food-safety problem occurs. Industry and retail establishments should routinely maintain product source and shipping information for quick access in conducting tracebacks and trace forwards and develop methods to rapidly notify customers

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(e.g., blast e-mail/fax). Public health agencies should establish relationships with industry and retail establishments before a food-safety problem occurs. They should also develop a list of control measures to immediately put in place when a recall has been issued, and be aware of common errors that lead to recalled food being put back into commerce.

Control of Secondary Spread (Section 6.3)

Education (6.3.1, 6.3.2, 6.3.4)

Education is key to preventing the spread of infection from individuals exposed to the original outbreak source to others through food, water, and person-to-person contact. Health-care providers should be encouraged to collect appropriate patient specimens and report cases of notifiable disease to the health department (6.3.1). The public should be reminded of basic food-safety precautions as well as means to decrease risk for infection through the current outbreak (6.3.2). The operator of the implicated facility should be notified of the steps needed to control the situation and to prevent further outbreaks (6.3.4). Food workers at the implicated facility should be educated about the disease (e.g., symptoms, mode of transmission, and prevention) and general infection control precautions including thorough hand-washing, not working when ill, and use of gloves when handling ready-to-eat foods (6.3.4).

Excluding Infected Persons (6.3.3)

Infected persons should be excluded from settings where transmission might occur including food-preparation, health-care, and child-care settings. Individuals who are no longer ill with vomiting or diarrhea can usually return to work without testing if they practice good personal hygiene and are adequately supervised. For some diseases or settings, however, testing might be necessary to ensure the person is no longer likely to transmit the disease. Regardless, local ordinances or state statutes should determine requirements for returning to work.

Prophylaxis (6.3.5)

For some diseases, prophylaxis might be appropriate, and the public health agency should work with area hospitals, physicians, local health departments, specialty clinics, or other health-care providers to provide vaccination, immune globulin, or antibiotics to exposed persons. Special attention should be given to prophylaxis of groups at higher risk for severe illness and poor outcomes from foodborne disease including infants, pregnant women, the elderly, and immunocompromised persons.

Communication (Section 6.4)

Communication is critical in determining what control measures to implement and when to change an intervention's focus.

Outbreak Response Team (6.4.1)

Information should routinely be shared with all members of the outbreak response team including actions taken and updates on the outbreak (6.4.1). Agency heads should routinely receive information about the status of the investigation (6.4.2). If the outbreak is potentially multijurisdictional, other agencies and organizations should also routinely receive status reports.

Implicated Facility (6.4.1, 6.4.4)

The owner/manager of the implicated facility should be contacted as soon as possible about potential control measures and instructed or advised about the need to report any new information that could affect the investigation. Because enforcement action may result from the investigation, it is important to understand the local legal framework before interacting with facilities that may be linked to an outbreak.

Industry (6.4.4)

Interactions with the food industry and related trade associations can help dispel misconceptions about the outbreak and take

Overview of Chapter 6. Control Measures

advantage of a teachable moment. However, state, local and federal agencies need to have working relationships with industry *before* an outbreak occurs.

The Public (6.4.3)

Communication with the public might be necessary in response to an outbreak if risk for exposure to the source is ongoing or if urgent medical treatment is needed for individuals who already have been exposed. If the outbreak involves a distributed product that is being recalled, the public must be notified using all available sources, including the Internet, television, radio, and newspaper. Messages to the public should follow good risk communication practices and be prepared with assistance from a Public Information Officer. Attempts should be made to reach all members of the population at risk, including non-English speaking and low-literacy populations.

Conclusion of the Outbreak Investigation (Sections 6.5, 6.6, 6.7)

Determining End of Outbreak and Post-Outbreak Monitoring (6.5.1, 6.5.3)

Most outbreaks can be considered over when two or more incubation periods have passed without new cases (6.5.1). Post-outbreak monitoring is necessary to ensure the outbreak has ended and the source has been eliminated (6.5.3). Efforts should be made to monitor the population at risk for disease, the implicated foods for contamination, and the implicated facilities to make sure they are complying with all required procedures. The latter may require increased inspections and customized training.

Postoutbreak Briefing (6.6)

All members of an outbreak response team should be briefed on the results of the investigation, including the cause, long-term and structural control measures, effectiveness of outbreak control measures, problems with the response effort and needed changes, and need for further study.

Outbreak Report (6.7)

Summary reports should be prepared for all outbreaks to document activities, educate staff, and look for trends across outbreaks that can be useful in future investigations. For a large outbreak, the final report should be more comprehensive, with information provided by all team participants. Such a report should be disseminated to all participating organizations and investigators. Reports should not identify individuals or share other legally nonpublic information, unless absolutely necessary, nor should they include inappropriate language.

Control of Future Outbreaks (Section 6.8)

An outbreak investigation might point to the need for future studies or research (6.8.1). It might identify the need for broad education efforts of the public, the food preparation industry, or health-care providers (6.8.2). It might also identify the need for new public health or regulatory policies at the local, state or federal level such as changes in inspection practices, source controls, or surveillance procedures (6.8.3). The investigation of an outbreak might also identify the need for new measures to detect, control, or eliminate pathogenic microorganisms (or their toxins) from food (i.e., applied food research) (6.8.4).