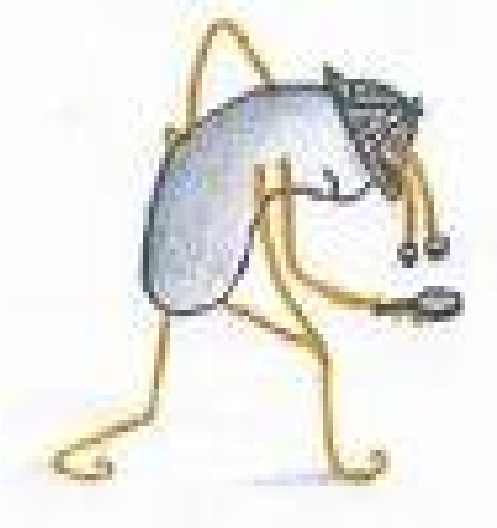
Foodborne and Waterborne Disease Outbreak Investigation Resource Manual



Arizona Department of Health Services

Office of Infectious Disease Services
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http://www.azdhs.gov/phs/oids/index.htm

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Preface

The *Foodborne and Waterborne Disease Outbreak Investigation Resource Manual* describes the general approach to outbreaks of foodborne diseases, including preparation, detection, investigation, control and follow-up. This manual reviews the general background of foodborne illnesses, the roles and responsibilities during an outbreak, the epidemiologic investigation, the laboratory analysis and the environmental assessment that all need to occur during an outbreak investigation.

This manual is meant to serve as a comprehensive source of information for individuals and agencies involved in foodborne disease investigation and control. This resource manual is not intended to replace existing procedure manuals. Instead, it should be used as a reference document for comparison with existing procedures, for filling in gaps and updating agency-specific procedures, for creating new procedures where they do not exist, and training staff.

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ACKNOWLEDGEMENTS

The Arizona Department of Health Services acknowledges the following sources which served as excellent resources for the development of this manual:

- Arizona Department of Health Services. *Infectious Disease Investigation Manual*. December 2003.
- Kansas Department of Health and Environment. *Foodborne Illness and Outbreak Investigations Manual*. March 2008.
- Wisconsin Division of Health. *Foodborne and Waterborne Disease Outbreak Investigation Manual*. January 2005.
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- International Association for Food Protection. *Procedures to Investigate Foodborne Illness*. 5th Ed. 1999. Reprinted 2007.
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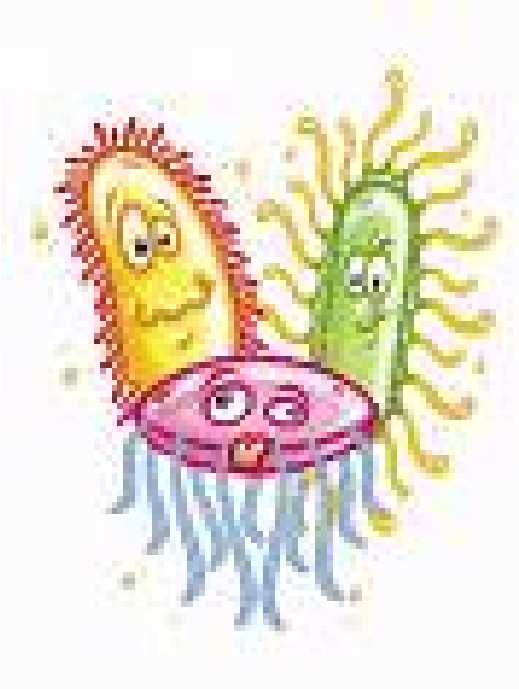
SECTION I

FOODBORNE ILLNESSES



SECTION I: FOODBORNE ILLNESSES

Introduction and Background

Foodborne and waterborne disease outbreaks are of urgent public health importance and immediate reporting of these diseases or outbreaks by physicians, laboratory directors and other health care providers to local health departments is mandated by Arizona law (*Arizona Administrative Code (A.A.C) R9-6-202 and A.A.C. R9-6-204*). The public depends on health departments and food regulators for protection from foodborne illness. Such protection relies on rapid detection of outbreaks, determination of the cause of the outbreak, and incorporation of control measures to protect the public.

Foodborne pathogens cause an estimated 76 million cases of foodborne illness, 325,000 hospitalizations, and 5,200 deaths in the U. S. annually. Related medical costs and lost wages are significant, accounting for a yearly loss of up to $17 billion[1]. In Arizona, the main bacterial causes of food-related illness are *Salmonella*, *Campylobacter, Shigella*, and *Escherichia coli* O157:H7. Viral pathogens, specifically Norovirus (formerly known as Norwalk-like virus) and Hepatitis A virus, are also major causes of foodborne illness in Arizona.

Food-related and other diarrheal illnesses remain underreported throughout the U.S., including in Arizona. Most diarrheal illnesses resolve within 24 to 48 hours without medical attention. As a result, many food-related illnesses are not diagnosed and associated foodborne disease outbreaks are often not recognized. This poses a challenge for public health professionals to maintain the knowledge and resources to identify and respond to these outbreaks.

The careful and meticulous investigation of foodborne and waterborne outbreaks is essential for disease control and prevention. Several key questions need to be addressed to determine the most effective control measures. What is the extent of the illness and who was affected? When and where did the critical exposure take place? What was the vehicle or how was the disease transmitted? What is the etiologic agent? Investigations of foodborne and waterborne outbreaks should proceed scientifically and professionally and not in reaction to the media or political pressures.

Investigation of food and waterborne disease outbreaks are rarely, if ever, accomplished by a single individual. A proper investigation generally requires the efforts of a team of individuals with different areas of expertise. This manual is intended to provide a structure for coordinating the activities of the various public health, laboratory, and administrative agencies responsible for the investigation, prevention, and control of food and waterborne disease in Arizona.

[1] Mead, P.S., et al. "Food-Related Illness and Death in the United States." *Emerging Infectious Diseases*. 1999:5(5), pp.607-25

FUNDAMENTAL CONCEPTS

Proper and thorough investigation of foodborne disease outbreaks requires a solid understanding of the fundamental concepts related to foodborne illnesses.

> **Foodborne illnesses** refer to diseases acquired through eating or drinking contaminated food or liquids.

Characteristics of Foodborne Pathogens:

The most frequent causes of foodborne illnesses include bacteria, bacterial toxins, viruses, and parasites.

Bacteria are one-celled living microorganisms ranging in size from 1 micrometer to 10 micrometers in length. They are naturally found in the environment (sometimes in a spore form) or invarious animal reservoirs. Bacteria can multiply in or on food and cause foodborne infections in
persons who consume contaminated food or liquids. *Campylobacter* and *Salmonella* are the most reported causes of foodborne infections in the United States as well as in Arizona.

Toxins most often associated with foodborne illnesses are poisons produced or released by certain bacteria. (NOTE: Though certain chemicals and toxins from plants, animals, and fungi can cause illness, this manual will focus mainly on toxin-producing bacteria.) When ingested, bacterial toxins usually act locally within the human body, but may spread to other parts and damage cells, tissues, and the host immune system. *Bacillus cereus*, *Staphylococcus aureus*, and *Clostridium botulinum* are well-documented toxic foodborne agents. *E. coli* O157:H7 and *Shigella spp.* also produce toxins that cause disease, which may lead to severe complications. When foodborne illness is caused by bacterial toxins, it is known as a foodborne intoxication. *Staphylococcus aureus* is the most reported cause of foodborne intoxications.

Viruses are minute organisms that reproduce only within living cells. Outside of a living cell, a virus is dormant, but once inside, it takes over the resources of the host cell and begins the production of more virus particles. Nonetheless, they can remain infectious in food and may cause foodborne infections in humans. Hepatitis A virus and Norovirus are the most recognized food-related viruses.

Parasites are single or multi-celled organisms with dimensions greater than 10 micrometers. Parasites reproduce within a host and cannot multiply in food. However, some
parasites develop a cyst form that is inert and resistant to the environment. This cyst, when ingested through food or liquids, can multiply within humans and cause foodborne infections. *Giardia lamblia* is the most frequently reported foodborne parasite. *Cryptosporidium parvum* is also one of the more frequently reported waterborne and foodborne parasites and has been associated with several large outbreaks in the past.

The following table summarizes the characteristics of potential foodborne pathogens.

Characteristics of Foodborne Pathogens			
	Bacteria	**Viruses**	**Parasites**
Cause infections	X	X	X
Cause intoxications	X		
Survive in environment	X	X	X
Multiply in environment	X		
Multiply in host	X	X	X
Multiply in food	X		
Form spores	X		
Produce toxins	X		
Form cysts			X

Foodborne Transmission of Pathogens and Toxins:

Food may become contaminated during production and processing or during preparation and handling.

Food production and processing:

Animals naturally harbor many foodborne bacteria in their intestines that can cause illness in humans, but often do not cause illness in the animals. During slaughter, meat and poultry carcasses can become contaminated if they are exposed to small amounts of intestinal contents. Other foods, such as fruits and vegetables, may be contaminated if washed or irrigated with water that is contaminated with pathogens from animal or human feces. Thorough cooking of raw foods and washing ready-to-eat foods (i.e. foods not normally cooked or further processed before being eaten) with clean water can decrease the risk of infection.

Food preparation and handling:

• *Cross-contamination*: Pathogens naturally present in one food may be transferred to other foods during preparation if the same cooking equipment and utensils are used without washing and disinfecting in between. If the foods are ready-to-eat foods, contamination can lead to illness.

• *Infected individuals*: Most foodborne pathogens are shed in the feces of infected persons and these pathogens may be transferred to others via the fecal-oral route. In other words, infected individuals who do not adequately wash their hands after using the toilet, may contaminate ready-to-eat food that they handle. Even minute quantities of feces, not visible to the

naked eye, may contain many pathogens and cause illness. Bacteria present in pus-filled lesions and found naturally in mucous membranes of the nose may also be transmitted from the hands of an infected foodhandler to ready-to-eat food.

> The **fecal-oral route** of transmission describes the ingestion of stool from an infected person or animal through food, water, or direct contact.

• *Inadequate cooking* or *improper holding temperatures*: Under optimal conditions, bacteria may multiply and produce toxins within food. Bacterial toxins that are produced are heat stable and are not destroyed by cooking temperatures.

Classifications of Foodborne Illnesses:

Foodborne illnesses are classified as infections or intoxications.

Foodborne infections are caused by consuming foods or liquids contaminated with bacteria, viruses, or parasites. These pathogens cause infection in one of two ways:
• Invading and multiplying in the lining of the intestines and/or other parts of the body such as blood or other tissues.
• Invading and multiplying in the intestinal tract and releasing a toxin (*Bacteria only*).

Foodborne intoxications are caused by consuming foods or beverages already contaminated with a toxin. Sources of toxins are as follows:
• Certain bacteria. (NOTE: Viruses and parasites cannot cause intoxications.)
• Poisonous chemicals.
• Natural toxins found in animals, plants, and fungi.

Clinical Features of Foodborne Infections:

The symptoms of most foodborne illnesses include diarrhea, nausea, vomiting, and abdominal cramping. Often mistakenly called the “stomach flu”, these symptoms appear on average 24 to 48 hours after infection and last for about 1 to 2 days. Symptoms of intoxication typically appear within hours of exposure. **Appendix F** provides tables that are useful in determining potential causes of foodborne illnesses.

Incubation periods are important clues when determining possible causes of disease. For most diseases, infected individuals can transmit pathogens during the incubation period, when they show no symptoms of illness. For example, an individual, who is infected with the Hepatitis A virus can shed the virus in stool (feces) and pass the virus to others two weeks before clinical signs appear or the person feels ill.

> **Incubation period** refers to the interval from the time an individual is infected to the time when symptoms first appear.

Recovery following a foodborne illness can vary according to the pathogen, individual host factors, and antimicrobial use. Antimicrobial use can either shorten or lengthen the recovery period, depending on the pathogen. Similar to the incubation period, individuals may continue to shed the organism in their stool during the recovery period and can potentially infect others. It is also possible for individuals to harbor an infectious agent but remain asymptomatic (i.e. show no symptoms of illness) and these individuals are considered to be in the **carrier state**. Individuals who are in the incubation period or recovery period of an illness are known as **carriers**.

Recovery period refers to the period when symptoms decline and illness improves.

The following table summarizes the characteristics of infections versus intoxications.

Infections *vs*. Intoxications

	Infections	**Intoxications**
Organism	Bacteria Virus Parasite	Toxin
Mechanism	Invade and multiply within the lining of the intestines	No invasion or multiplication
Incubation period	Hours to days	Minutes to hours
Symptoms	Diarrhea Nausea Vomiting Abdominal cramps Fever*	Vomiting Nausea Diarrhea Double vision Weakness Respiratory failure Numbness Sensory and motor dysfunction
Transmission	Can be spread person-to-person via the fecal-oral route	Not communicable
Factors related to food contamination	Inadequate cooking Cross contamination Poor personal hygiene Bare hand contact	Inadequate cooking Improper holding temperatures

* The lack of fever in foodborne intoxications may aid investigators when determining the cause of the foodborne illness that is being observed.

Public Health Surveillance and Foodborne Illnesses:

> **Public health surveillance** is the routine collection, analysis, summarization, and dissemination of data for the purpose of preventing and controlling the spread of disease.

The Office of Infectious Disease Services (OIDS) at the Arizona Department of Health Services (ADHS) is involved in the surveillance of infectious diseases in Arizona, including enteric diseases that commonly cause foodborne or waterborne illnesses. This passive surveillance system depends upon the timely and accurate reporting of specific diseases by physicians, hospitals, and laboratories in Arizona to the public health system as stated in the Arizona Administrative Code (*A.A.C.R99-6-202 and R9-6-204*). Refer to **Appendix C** for a list of Reportable Diseases in Arizona and a copy of the Arizona Notifiable Disease Form. OIDS records all the disease information in a surveillance database (MEDSIS – Medical Electronic Disease Surveillance Intelligence System) of notifiable diseases for the State of Arizona.

Foodborne illnesses are monitored through the statewide surveillance system to assess disease impact, to detect trends, and to guide interventions. OIDS also collects and monitors reports of outbreaks of gastrointestinal illness of unknown etiology. Outbreaks of disease, regardless of the cause, or an unusual occurrence of any disease, including those that appear to be food-related or of public health concern, must be reported to ADHS within 24 hours of detection. (*A.A.C. R9-6-202*).

Laboratory Diagnosis of Foodborne Illnesses:

Most foodborne infections are diagnosed through the identification of the pathogen in stool collected from infected persons. Vomitus has also been used to detect certain organisms and confirm the etiology. Blood samples are recommended for the laboratory diagnosis of systemic infections.

Refer to **Section IV** on Laboratory Analysis for more detail about specimen collection, food sampling, and packing and shipping of specimens for testing.

The following table provides a list of reportable diseases that may be foodborne, their corresponding pathogen, recommended specimens for laboratory diagnosis, and testing capabilities at the Arizona State Laboratory. Some diseases require notification to ADHS within 24 hours, and some require isolate submission to ASHL.

Notifiable Food and Waterborne Illnesses and Conditions in Arizona

Disease or condition	*Pathogen*	*Specimen**	*Transport Medium**	*ASHL Testing*
Bacterial				
Anthrax (gastrointestinal)[1]	*Bacillus anthracis*[2]	Blood		By request only
Botulism[1]	*Clostridium botulinum*	Stool, Blood, Serum	None	By request only - Sent to CDC
Brucellosis	*Brucella spp.*[2]	Blood		By request only
Campylobacter infections	*Campylobacter spp.*	Stool	Cary-Blair	Routinely
Cholera/*Vibrio*[1]	*Vibrio cholerae*[2]*/Vibrio spp.*	Stool	Cary-Blair (do not refrigerate)	Routinely
Escherichia coli O157:7[1] (and other shiga-toxin producing *E. coli*, also known as STEC)	*Escherichia coli spp.*[2]	Stool	Cary-Blair	Routinely
Hemolytic Uremic Syndrome[1] (HUS)	Usually *E. coli*	N/A	N/A	N/A
Listeriosis[1]	*Listeria monocytogenes*[2]	Blood, spinal fluid	None (ship at 4° C)	Routinely
Salmonellosis, including typhoid fever	*Salmonella spp.*[2]	Stool	Cary-Blair	Routinely
Shigellosis	*Shigella spp.*[2]	Stool	Cary-Blair	Routinely
Yersiniosis	*Yesinia enterocolitica*[2]	Stool	Cary-Blair	Routinely
Viral				
Hepatitis A	Hepatitis A virus	Blood	None	Routinely
Hepatitis E	Hepatitis E virus	Blood	None	By request only - Sent to CDC
Norovirus	Norwalk virus	Stool, Vomitus	None, submit raw	By request only
Other Viral Gastroenteritis	Calicivirus/Rotovirus	Stool, Vomitus	None, submit raw	By request only
Parasitic				
Amebiasis	*Entamoeba histolytica*	Stool	PVA – O&P Kits	Routinely
Cryptosproridiosis	*Cryptosporidium parvum*	Stool	PVA – O&P Kits	Routinely
Cyclospora infection	*Cyclospora cayetanensis*	Stool	PVA – O&P Kits	Routinely
Giardiasis	*Giardia lamblia*	Stool	PVA – O&P Kits	Routinely
Trichinosis	*Trichinella spiralis*	Blood	None	Sent to CDC

[1] Suspect or confirmed cases must be reported to ADHS at within 24hours (A.A.C. R9-6-202)

[2] Isolates must be sent to ASHL for further analysis (A.A.C. R9-6-204)

* Specimen and transport medium as necessary for collection during an outbreak investigation (isolates are the preferred specimen for testing at ASHL when available)

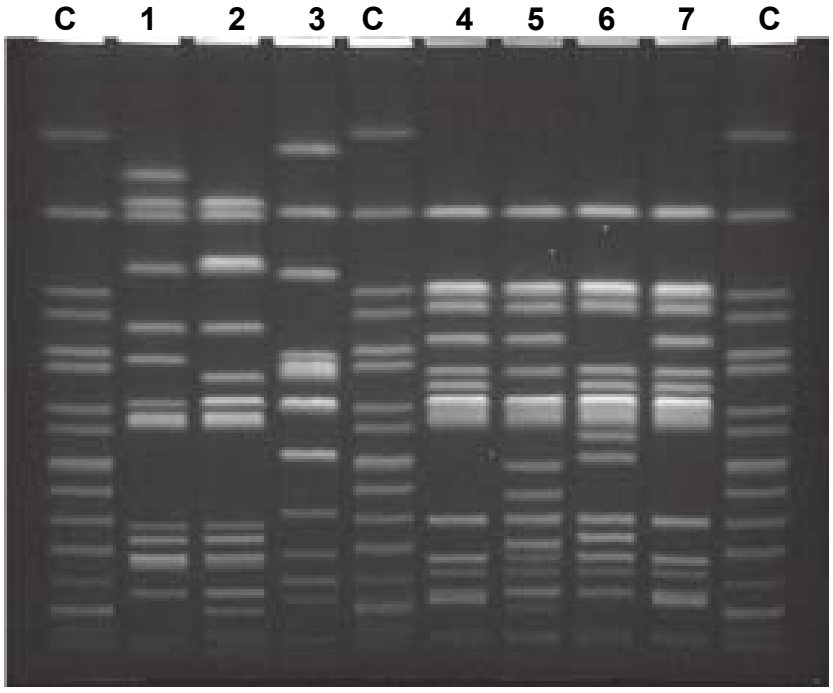
Pulsed-field Gel Electrophoresis (PFGE):

A laboratory technique frequently used to assist the surveillance and investigation of foodborne illness and outbreaks is pulsed-field gel electrophoresis (PFGE). This technique creates a unique “DNA fingerprint” or PFGE pattern for disease-causing bacteria isolated from infected persons. These patterns may be compared at the local, state, and national levels to identify potential outbreaks and to focus the epidemiologic investigation of outbreaks.

During the PFGE process, restriction enzymes are used to separate the bacterial DNA into different sized fragments. Pulsing electric currents then move the DNA fragments through a porous agarose gel. Smaller fragments move quickly through the gel while larger fragments move more slowly. The different fragments form a unique “DNA fingerprint” or band pattern for each bacterial isolate. These PFGE patterns are uploaded to a national database at the Centers for Disease Control (CDC) called PulseNet where they may be analyzed to determine if the patterns are similar or indistinguishable and may provide additional information during investigations. Human isolates with indistinguishable PFGE patterns warrant further investigation to identify any potential epidemiological links among the infected individuals. PFGE may also be conducted using bacterial isolates from food, and the patterns may be compared with those of the human isolates.

The following image is an example of the “DNA fingerprint” of seven *Salmonella* isolates. The vertical lanes with a numeric label represent the PFGE pattern of a single isolate. The lanes labeled with a “C” are the control lanes.

Isolates #4 and #7 appear to have PFGE patterns that are indistinguishable. Follow-up should be conducted with the individuals from whom these bacterial isolates originated to determine if the individuals have any potential epidemiological links.



Food Handlers, Foodborne Illnesses, and Public Health:

Food handlers are persons who directly handle or prepare food. They may work as paid employees or volunteers, serving food in a variety of settings: food establishments, health care facilities, day cares and schools, community functions, etc. Therefore, food handlers have an important responsibility to follow safe food preparation and handling practices to prevent illness.

Though food handlers are not at higher risk for developing a foodborne illness compared to other persons, food handlers are at higher *public health* risk for spreading pathogens. Infected food handlers, in particular, represent an extremely high risk for the transmission of pathogens to others through food when bare hand contact with ready-to-eat foods and poor hand washing are present.

The following tables are lists compiled by the Centers for Disease Control and Prevention (CDC) of (1) the pathogens often transmitted by infected food handlers and (2) the pathogens occasionally transmitted by infected food handlers[1]. Also included are the ADHS reporting requirements for the corresponding disease.

Pathogens Often Transmitted by Food Contaminated by Infected Food Handlers	
Pathogen	**Notifiable Disease in Arizona**
Norovirus	Yes
Hepatitis A virus	Yes
Salmonella Typhi[1]	Yes
Shigella spp.[1]	Yes
Staphylococcus aureus	No
Streptococcus pyogenes	No

[1]Submission of isolate to ASHL is required per A.A.C. R9-6-204

1 Centers for Disease Control and Prevention. “Diseases Transmitted Through the Food Supply”. Federal Register: November 6, 2003 (Volume 68, Number 215)

Pathogens Occasionally Transmitted by Food Contamination by Infected Food Handlers	
Pathogen	**Notifiable Disease in Arizona**
Campylobacter jejuni	Yes
Cryptosporidium parvum	Yes
Entamoeba histolytica	Yes
Enterohemorrhagic *Escherichia coli*[1]	Yes
Enterotoxigenic *Escherichia coli*[1]	Yes
Giardia lamblia	Yes
Non-typhoidal *Salmonella*[1]	Yes
Taenia solium	Yes
Vibrio cholerae 01[1]	Yes
Yersinia enterocolitica[1]	Yes

[1] Submission of isolate to ASHL is required per A.A.C. R9-6-204

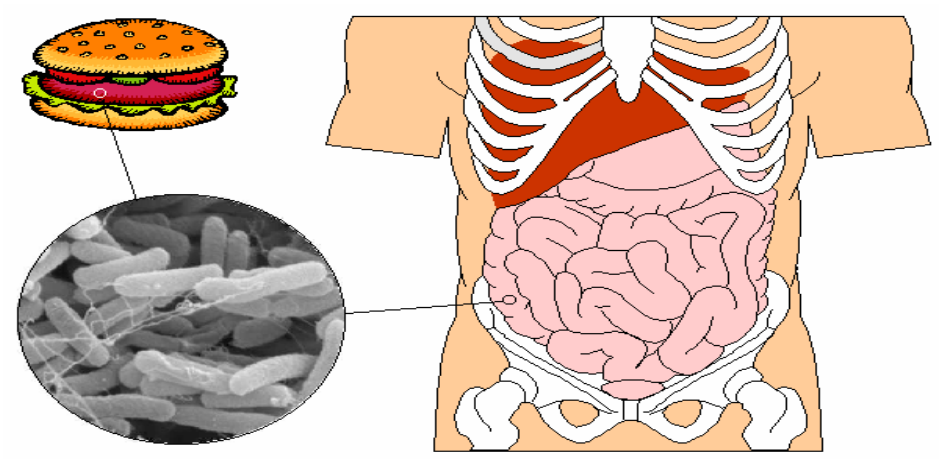
Because of the potential for food handlers to transmit pathogens through the food they serve, work restriction and exclusion requirements have been established for infected food handlers in Arizona. Employees who are excluded cannot work in any food handling activity in the food establishment until written medical documentation is provided, stating that the person is free of the infectious agent of concern. Employees who are restricted can continue to work in the food establishment, but cannot work with exposed food, clean equipment utensils and linens, or unwrap single service and single-use articles until restrictions have been removed.

According to the 1999 Arizona Food Code, food handlers who are diagnosed with an illness due to Norovirus, *Salmonella* Typhi, *Shigella spp.*, Enterohemorrhagic or Shiga toxin producing *E. coli*, or Hepatitis A virus should be excluded from working in a food establishment. Food handlers suffering from diarrhea, fever, vomiting, jaundice, or sore throat with fever or who have a positive stool result for *Salmonella* Typhi or *Escherichia coli* O157:H7 should be restricted from food handling, but may be able to serve in another capacity within a food establishment.

More information about exclusion and restriction requirements for certain health conditions is available in **Appendix E**.

SECTION II

FOODBORNE DISEASE OUTBREAKS



SECTION II: FOODBORNE DISEASE OUTBREAKS

Defining a Foodborne Disease Outbreak:

In Arizona, a *foodborne disease outbreak* is defined in the following ways:

1. Two or more individuals (from different households) who experience a similar illness after eating a common food or food from a common place.
Household members generally share many meals together and experience close personal contact with one another. Therefore, similar illness among members of a single household is not considered to be an outbreak.

2. An unexplained, unexpected increase of a similar illness, and food is a likely source.
Further investigation to identify the source of infection should be done. For example, an increased number of *Salmonella* Montevideo cases identified at the state laboratory may suggest that a foodborne disease outbreak has occurred.

Contact ADHS at (602) 364-3676 if an outbreak has occurred or if assistance is needed in determining if an outbreak has occurred.

Identifying Foodborne Disease Outbreaks:

Foodborne disease outbreaks may be identified from the following:

- Foodborne illness complaints from private citizens
- Medical evaluations of ill individuals from healthcare professionals at hospitals, clinics, or physician offices
- Routine surveillance and case investigation of reportable diarrheal illnesses by epidemiologists and public health nurses at state and local health departments
- Routine laboratory testing and techniques, including PFGE, conducted by microbiologists
- Information received through the media and public information officers
- Reports from state and federal food safety regulators and environmental health specialists

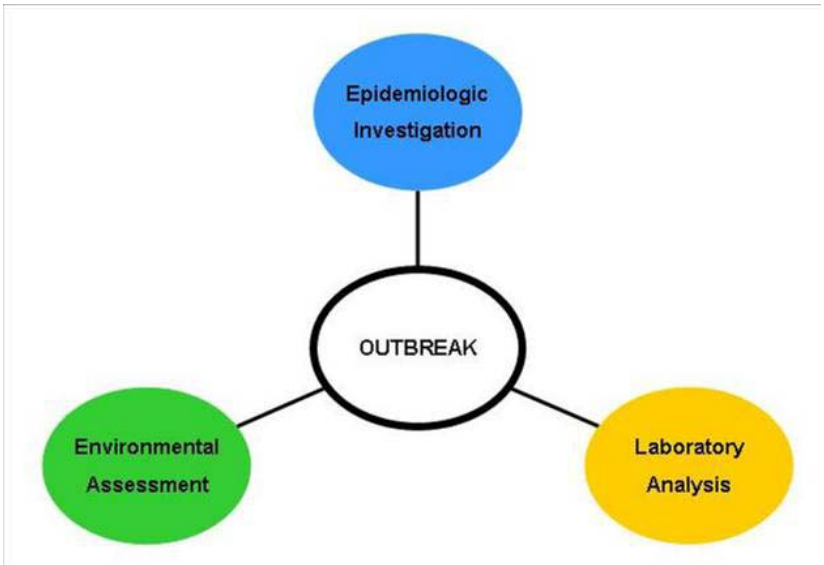
Reasons for Investigating Foodborne Disease Outbreaks:

Once a foodborne disease outbreak has been identified, an outbreak investigation should be implemented in order to:

- Identify the cause, the risk factor(s), or source of infection
- Implement interventions or corrective actions to prevent others from becoming ill
- Fulfill statutory obligations and respond to public and political concern
- Evaluate existing recommendations or strategies for preventing similar outbreaks
- Learn more about the public health implications of foodborne pathogens

Three Components of a Foodborne Disease Outbreak Investigation:

Foodborne disease outbreak investigations are conducted to determine what factors are associated with illness and what measures can be done to prevent further illness. This is achieved through (1) an epidemiologic investigation, (2) laboratory analysis, and (3) an environmental assessment. A thorough outbreak investigation cannot be conducted without these three components, which are often performed simultaneously. (See Sections III, IV, and V for more detail about the three components.)



Roles and Responsibilities in a Foodborne Disease Outbreak Investigation:

Successful foodborne disease outbreak investigations depend upon the coordination and collaboration of key personnel. In most outbreak investigations, the core investigative team is comprised of local health department public health nurses, environmental health specialists, medical investigators, epidemiologists, and microbiologists. Depending on the scope and size of an outbreak, the investigative team may include more or fewer investigators, and the different roles and responsibilities may overlap. Nonetheless, the outbreak investigators should work together to ensure that all necessary tasks are completed.

Before an outbreak, identify key individuals who will fulfill the various tasks of the Investigation Team. Choosing team members who are familiar with the day-to-day activities of the local/state health department will facilitate a rapid, efficient response. Depending on the disease, some or all of these individuals will be crucial in executing the local health department's response. All investigation team members should be informed of the epidemiology of the causative agent or suspected agents, and should be instructed on how to complete investigation forms and collect and submit specimens for laboratory testing. Training on procedures (questionnaire administration, specimen collection and submission, etc.) should be completed before an outbreak begins, if possible. Job action sheets explaining the role of each position should be developed ahead of time and passed out at the start of an outbreak so everyone is aware of their roles and functions. In addition, a person may have more than one role in an investigation.

Epidemiologist

- Assist in determining if an outbreak has occurred and if an investigation is needed
- Serve as lead investigator or primary coordinator in an outbreak investigation
- Facilitate and guide the steps in an outbreak investigation
- Provide technical, statistical, and overall support to an outbreak investigation
- Formulate a case definition; classify cases as suspect, probable, confirmed or ruled-out
- Maintain current line listing of cases, an epidemic curve, and number of suspect cases pending investigation
- Provide daily status reports of the number of suspect, probable and confirmed cases reported, investigations completed and pending and number of follow-ups for contacts
- Maintain timeline of events. Include dates and names on initial report, initial and subsequent contact with different agencies, meeting/conference calls, and decisions pertaining to the outbreak
- Coordinate with other epidemiologists (state and local), public health nurses, medical investigators, environmental health specialists, and microbiologists
- Maintain communication channels between programs, agencies, counties, and states, as needed
- Assist with multi-county or multistate outbreaks
- Train case investigators on how to complete an interview and compile the information daily
- Review case report/investigation forms to ensure completeness of data collection
- Distribute stool kits and collect clinical specimens to obtain a diagnosis as needed
- Provide educational materials to facilities and health care partners as needed to stem spread of disease
- Create and disseminate questionnaires and oversee data collection and analysis
- Analyze data and identify risk factors
- Create outbreak databases and train and supervise personnel entering data into the database
- Submit completed investigation forms and Communicable Disease Reports to the ADHS outbreak epidemiologist
- Ensure a final written report of the outbreak is submitted to ADHS within 30 days of the end of the outbreak

Public Health Nurse

- Conduct initial single case investigations with the potential to turn into outbreaks
- Administer interviews with persons associated with outbreaks
- Distribute stool kits and collect clinical specimens to obtain a diagnosis as needed
- Set up vaccination clinics as necessary
- Follow up with patients to ensure treatment or with contacts for prophylaxis or surveillance
- Maintain correspondence and collaborate with local healthcare professionals
- Implement control and prevention measures as needed to stop the spread of infection
- Provide educational information about infectious conditions and control and prevention measures
- Coordinate with food inspectors, medical investigators, and epidemiologists
- Conduct home visits as needed

Food Inspector or Environmental Health Specialist

- Conduct inspection of food establishments to determine possible source(s) of exposure
- Identify and address food safety issues that may have contributed to the outbreak
- Interview managers and food handlers about any illness experienced and their specific job duties
- Collect food and environmental samples, if needed
- Contact ADHS Outbreak Epidemiologist to coordinate testing of samples
- Fill out submission forms for food and/or water testing
- Obtain menu of food items served
- Perform Hazard Analysis and Critical Control Points (HACCP) investigation, if needed
- Work with the ADHS Office of Food Safety and Environmental Services to perform trace backs of implicated food items or ingredients as well as Federal Regulatory Agencies if necessary
- Provide daily updates to team members on inspection findings and status of control measures

Medical Investigator or Clinician

- Provide education to local health providers about the disease under investigation
- Assist ADHS and LHD staff with disease surveillance and investigation
- Provide technical guidance and overall support to an outbreak investigation
- Train LHD staff on proper protocols for treatment and prophylaxis
- Coordinate with LHD public health nurse, epidemiologist, and food inspector
- Assist in the creation of a case definition

Microbiologist

- Test clinical specimens or food samples to detect the pathogen associated with the outbreak
- Conduct further subtyping or laboratory analysis, if appropriate
- Coordinate with reference laboratories at other state or federal laboratories
- Coordinate with LHD public health nurse, medical investigator, or epidemiologist
- Maintain chain of custody for outbreaks of suspected intentional contamination

Other important roles that may or may not be needed for a particular investigation include the following:

Physician / Healthcare Provider

- Report notifiable diseases, including outbreaks, to local or state health department
- Provide clinical information and diagnosis for patients when available
- Assist in the collection of clinical specimens for laboratory testing

Administrator

- Ensure that sufficient resources (within or from an outside source) are available to respond to the outbreak and control its spread
- Ensure all individuals requiring computers, phones, copiers, vehicles, etc. have access to equipment
- Ensure overtime, after hours building access, travel reimbursement, cellular phone access, etc. are handled
- May serve as the main liaison with local physicians, the media, or ADHS
- Enforce statutes and regulations related to the health of residents, investigation of causes of disease, and prevention of spread of diseases within the county

Local Health Officer (If part of health department)

- Serve as medical consult to county staff
- Enforce statutes and regulations related to the health of residents, investigation of causes of disease, sanitation inspections, and prevention of spread of diseases within the county

Public Information Officer

- Deliver clear, consistent messages related to diseases and outbreaks
- Respond to media requests related to diseases and outbreaks
- Prepare/Review press releases. *Assistance is available from ADHS. Please call the ADHS PIO at 602-542-1094*
- Provide educational information to the general public

Federal Personnel (i.e., CDC, FDA, USDA, EPA)

- Provide guidance in national outbreaks or traceback operations
- Assist multistate outbreak investigations

Information Technology Specialist

- Assist in the creation of an outbreak database or modifying existing database
- Provide support for any problems that may arise from the database
- Request data entry personnel and train personnel on how to enter data correctly into the database

In the event of an intentional contamination of food, the following personnel and agencies may be called upon during an outbreak investigation:

Law Enforcement

- Coordinate with public health during initial threat assessment and investigation
- Contact and coordinate with Federal Bureau of Investigation
- Conduct criminal investigation
- Ensure collection of evidence in manner that is admissible in court

Emergency Management

- Coordinate efforts of all responding agencies
- Provide additional supplies, if needed

Lead Investigator

- Serves as point-of-contact to the Arizona Department of Health Services.
  Initial Notification
  - The ADHS outbreak epidemiologist will serve as the communication liaison between the local and state health departments, the state epidemiologist, and the state laboratory. He/she will also serve as consultant to the local outbreak lead investigator.
  - Depending upon the disease and situation, review with ADHS outbreak epidemiologist the methods and specimens needed to identify and type agent(s) suspected; specimen collection and transport issues such as time, temperature, transport media, quantity, etc.
  - Request for ADHS assistance, either on-site or from Phoenix, as needed.

Continued Communication

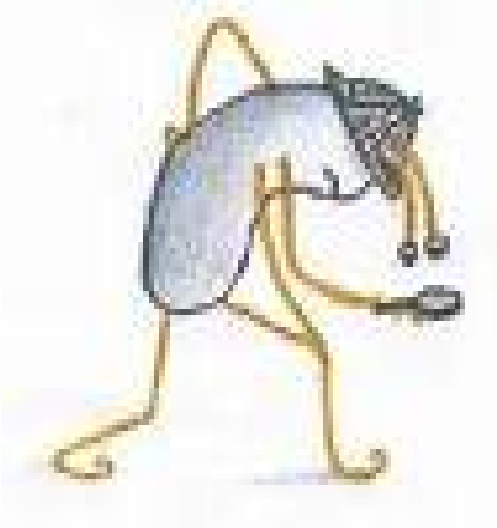
The outbreak lead investigator and the ADHS outbreak epidemiologist should maintain communication throughout the investigation.

- Apprise the ADHS outbreak epidemiologist on the status of the outbreak and intervention daily to weekly, depending upon the disease and circumstances.
  - Email updates are an easy way to maintain communication with all partners
- Notify ADHS outbreak epidemiologist of the need for additional laboratory specimen testing, test media, specimen kits, etc.
- Request for ADHS assistance, either on-site or from Phoenix, as needed.

- Review the epidemiology of the disease, measures for completing investigation forms, specimen collection procedures, priority of investigations, and state and county regulations pertinent to the disease and situation with all investigation team members.
- Assess resources available. Begin steps to pull case investigators and other resources. Stagger hours if needed.
  - Arrange staff assignments for the following 24-48 hours (or more).
- Prioritize and delegate the following activities to investigation team members:
  - Coordination of specimen collection and testing of suspected cases (or obtaining laboratory reports from medical facilities or labs).
  - Inspection of facilities such as day cares, restaurants, etc.
  - Interviewing cases.
  - Implementation of control and prevention measures.
  - Check surveillance database to determine the number of cases during the previous weeks, months, and similar time periods.
- Lead daily meetings with investigation team members.
  - Discuss findings of inspections, case investigations, and laboratory results.
  - Discuss hypotheses for possible increases in the disease.
  - Update core group on day's activities and prioritize next day's activities.
  - Discuss the need for improved control measures.
- Facilitate communication with schools, childcare centers, and other involved institutions:
  - Notification of the outbreak and control recommendations (e.g., school exclusions).
  - Facilitate review of immunization records and indicated follow up.
  - Education of school, childcare or institution staff.
  - Arrange for intervention clinics (immunization, prophylaxis, etc.)
- Facilitate communication with health care providers, hospitals, ERs.
  - Notification of the outbreak through the listserv for ICPnet, IDnet, County Health Officers or SIREN as needed [*ADHS has all Infection Control Practitioners, Emergency Rooms, County Health Departments and Indian Health Service Units on the Health Alert Network (HAN) and can assist in notification*, SIREN has blast fax capability].
  - Develop provider alerts, information or fact sheets and reporting reminders.
- Ensure proper dissemination of public information.
  - Assign and train staff to handle public calls and respond to questions.
  - Develop/provide educational materials for the public and media.
- Once an outbreak has been confirmed, an official declaration of an outbreak can be made. Depending upon the disease, this act will provide the local health department with authority to exclude students and staff from schools (see Arizona Administrative Code – Chapter 6, Article 7).

SECTION III

THE EPIDEMIOLOGIC INVESTIGATION



SECTION III: THE EPIDEMOLOGIC INVESTIGATION

PROCEDURES

The means by which these procedures are carried out may vary from county to county depending on number of staff, experience, and the presence of an Epi Team. Different investigation methods may be used depending on the source of the outbreak, such as a *common source* outbreak (in which a suspect exposure is presumably known – e.g., when several complaints come from the same restaurant on the same date, when people become ill after one party or meeting, or when there are simultaneous illnesses at one facility) versus a *community exposure* outbreak (where a number of people are ill with similar symptoms/lab results but there is no known exposure that ties these people together). In addition, the steps in investigating an outbreak are not always implemented sequentially. The following are general guidelines in a foodborne illness investigation.

The following table lists the essential steps of an epidemiologic outbreak investigation.

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Steps of an Epidemiologic Outbreak Investigation

1. Prepare for field work.
2. Establish the existence of an outbreak.
3. Contact and coordinate with key personnel.
4. Verify the diagnosis.
5. Define cases and conduct case finding.
6. Orient the data by time, place, and person.
7. Implement control and prevention measures.
8. Develop possible hypotheses.
9. Plan and conduct an epidemiologic study to test hypotheses.
10. Analyze the data collected and interpret results.
11. Report the findings of the outbreak investigation.

Preparation for a detailed epidemiologic investigation.

The Local Health Department (LHD) should have 6-8 stool culture kits on hand or readily available should an outbreak occur because in most cases stool specimens must be collected within 72 hours of onset of illness to isolate and identify certain pathogens (e.g. *Clostridium perfringens, Bacillus cereus, Staphylococcus aureus*). Lists of contacts such as administrative contacts, additional personnel, sanitarians, regional contacts, physicians, clinical laboratories, or other persons who may become involved in outbreak investigations should be assembled. Resource materials describing signs and symptoms, incubation times and specifics regarding specimen collection and appropriate kits to be used should be maintained and readily available to those processing the initial calls. It is also helpful to consult all team members to determine what role each will play in the investigation, and who the on-scene contacts will be.

Establish the existence of an outbreak.

Most reports of foodborne illness are sporadic and are often not associated with a recognized outbreak. The information collected during the initial report may help determine if a foodborne illness complaint is suggestive of an outbreak and whether or not an outbreak investigation is necessary. This preliminary information may also provide important clues about the cause and

source of the outbreak and will help guide the direction of the investigation. Depending upon who receives the initial foodborne illness complaint, a public health nurse, environmental health specialist, medical investigator, or epidemiologist is an appropriate person to collect this initial information.

Establishing the existence of an outbreak can be accomplished in a number of ways.

- Compare current numbers with numbers from the previous weeks or months, or from a comparable period during the previous years.
- Make sure a rise in numbers is not due to changes in reporting procedures, case definition, diagnostic procedures, or increased awareness at the local or national level.
- Make sure that communities such as resorts, college towns or migrant farming areas, that see regular fluctuations in population are not the cause of an increase in number of cases.
- Consult with the ADHS Infectious Disease Epidemiology Section to check on historical data trends and/or to see if surrounding jurisdictions are noting the same increase.
- Consider sending out a Health Alert to other counties and ADHS

Detailed information that should be collected as soon as possible includes, but is not limited to, the following:

- Information about the person reporting the potential outbreak
- Number of persons reporting illness
- Date and time of illness onset for each ill person
- Specific symptoms experienced
- Number of doctor visits and hospitalizations
- Number of stool samples collected for testing
    - ○ Recommend testing if not yet done
    - ○ Testing may still be beneficial even if symptoms have ceased
- Specific diagnosis identified, if known
- Total number of persons exposed, both ill and not ill
- Date and time food was consumed
- Location where food was prepared and eaten
- Specific food or drink consumed, including ice
- Other commonalities, including other shared meals, activities or animal contacts
    - ○ Earlier shared meals may be a source of infection
- Additional information, including specific activities and medications taken before the onset of illness
    - ○ Other factors besides food may have influenced illness
- List of contact information of all persons exposed

Contact and coordinate with key personnel.

Once the existence of an outbreak is verified, the next step is to answer the following question:

“Who needs to know that an outbreak has occurred?”

Because of the nature of outbreak investigations, personnel who fulfill key roles in an outbreak investigation should be notified as soon as possible. The ADHS Infectious Disease Section should be notified within 24 hours of a suspected outbreak. A successful investigation requires a teamwork approach and collaboration among, but not limited to, epidemiologists, medical investigators, public health nurses, food inspectors, microbiologists, healthcare providers, regulators, and the media. Occasionally, foodborne outbreaks may involve individuals in a day

care or an adult care setting, and personnel from these entities should also be notified.

Most communication will occur between the outbreak epidemiologists, public health nurses, and the environmental health services specialist assigned to the outbreak. Depending upon the county affected and the source of the food (i.e., licensed food establishment, retail food establishment, or food processing plant), food inspectors at contract counties or state agency may need to be contacted.

Epidemiologists and medical staff at ADHS are available at (602) 364-3676 to assist with coordination and communication of key personnel, especially between state and federal entities.

Verify the diagnosis.

The question to be answered in this step is the following:

"What is the organism that has caused illness?"

Analyze clinical histories of cases and have laboratory tests performed in order to confirm the etiologic agent associated with the illness. For most foodborne disease outbreaks, stool samples are collected from persons experiencing diarrhea to identify or confirm the pathogen. Blood cultures or serology testing are recommended for systemic infections, such as *Listeria monocytogenes* or hepatitis A virus. However, serology is less useful for most other foodborne illnesses.

When collecting clinical specimens for testing, keep the following in mind:

- **Stool collection should be strongly recommended whenever a person is experiencing or has recently experienced a diarrheal illness.** If possible, requests for stool samples should begin during the initial foodborne illness report, and such requests may continue throughout the outbreak investigation.
- Collect 15-20 grams of whole stool (about the size of a walnut), 10-15 ml of diarrheal stool (about 3 tablespoons) or 3-4 rectal swabs with a visible amount of fecal material from each person. Vomitus may also be collected (10-15 ml) although not necessary if stool is available.
- Make sure you have enough specimen collection kits available and that the samples are collected, labeled and stored properly (see **Section IV** and **Appendix D** for additional information).
    - Keep fresh stool specimens cold from the time they are produced until the time they reach the Arizona State Health Laboratory (ASHL). Refrigeration temperature (39°F/4°C) prevents the proliferation of normal intestinal flora from overgrowing the foodborne pathogen.
    - Completely fill out the ASHL specimen testing request form to include with the specimen or fax over to the ASHL. (see **Section IV** and **Appendix D**).
- Collect fresh stool specimens from as many people as you can. The criteria for confirming that an outbreak was caused by a specific agent depends on isolating the agent from at least two people involved in the outbreak. Collection of five specimens is usually sufficient to confirm the diagnosis.
- Laboratory testing may still be beneficial even after symptoms have ceased. For many foodborne illnesses, an ill person may continue to shed the pathogen in their stool even after symptoms have disappeared and stool appears normal.
- Laboratory testing of individuals who are not ill is not routinely recommended, except

when required to remove specific exclusion or restriction guidelines.
- Even in the absence of any laboratory confirmation, positive results, or definitive diagnosis, pathogens may still be implicated and public health measures may be implemented solely based on information collected during the outbreak investigation.

The pathogen, specifically bacteria or bacterial toxins, may also be identified through food samples. However, food samples will generally not be tested until the investigation yields a specific food or set of foods suspected and a specific pathogen identified by clinical specimens. Viral and parasitic identification is extremely difficult.

Refer to **Section IV** for more information about collecting clinical specimens and food samples.

Define cases and conduct case finding.

Important questions to ask at this stage in an outbreak investigation are the following:

"What criteria should be used to determine if an ill person is part of an outbreak?"
"Who else is ill?"

Outbreaks and their corresponding investigations can quickly become complex. As a result, it is important to establish a clear understanding of the outbreak as early as possible. Organizing the preliminary information will help in the development of a case definition and may also provide clues about the pathogen and its transmission.

Line List.

To initially assist in the organization of data, a good starting point can be the creation of a "line listing" table. Cases names and numbers are listed down the left hand column, and the heading row at the top of the table should contain pertinent information such as demographic information, clinical information, and other epidemiologic information, including risk factors possibly related to illness.

Line List Example:

ID	Name	Age	Sex	Onset Date	Onset Time	D	N	V	F	Office Brunch	Sample?	Results?
1	S.A.	45	F	10/19/08	1:00a	Y	Y	Y	N	Y	Y	Pending
2	S.I.	57	F	10/18/08	11:00p	Y	Y	N	N	Y	Y	S Newport
3	C.W.	39	M	10/18/08	11:45p	Y	N	N	N	Y	Y	Pending
4	J.M.	32	M	Not ill						Y	N	
5	J.W.	27	F	Not ill						Y	Y	Pending
6	C.O.	25	F	Not Ill						N		
7	C.T.	16	F	10/19/08	6:00a	N	Y	N	Y	Y	N	

This line list shows that four ill individuals experienced similar symptoms around the same time period. In addition, they all attended the same office party. Based on this information, it is highly likely that these individuals became ill after eating something served at an office brunch they attended 2 days earlier.

(Refer to **Appendix C** to learn more about creating a line listing.)

Case definition.
Determination of case numbers is based on creating a case definition. A case definition is a set of criteria for deciding whether an individual should be classified as a case. The case definition places boundaries on who is considered a case, so the investigation does not include those with illnesses unrelated to the outbreak. The common elements of a case definition include information on symptoms, laboratory results, time, place and person.

Good case definitions should include:

- Simple and objective clinical criteria (e.g., diarrhea defined as three or more loose stools in a 24-hour period, vomiting, or nausea with a fever ≥ 101ºF).
- Laboratory confirmation may also be a criterion for classifying an ill person as a case.
- *Time*: onset of illness during a specific time period (e.g., onset of illness in the past two weeks or onset of illness after June 15).
- *Place*: definition may include the location of exposure or the community the ill persons reside or work (e.g., Maricopa County or Restaurant X).
- *Person*: the case definition may focus on individuals with certain characteristics (e.g., persons who attended an event).

Early on in an investigation, it may be worthwhile to have a more inclusive case definition or several case classifications (e.g., confirmed, probable, or suspect). Such flexibility allows the investigator to better characterize the extent of the outbreak, to identify more persons potentially affected, and to start formulating hypotheses. For example, a case might be classified as confirmed if laboratory confirmation of the disease is available and if the time, place, and person criteria have been met. A case that exhibits the typical clinical characteristics of the disease and meets the time, place, and person criteria, but has no laboratory confirmation, might be considered a probable case. A case with some, but not all, of the criteria might be classified as a suspect case.

As more information becomes available, the case definition can be refined to ensure that the definition is as specific as needed and that as many of the “actual” cases are captured. Unfortunately, no case definition is 100% accurate, and persons with a mild infection may be missed.

Case Definition Example:

Component of definition	Question asked	Factual Item
Clinical Criteria	What were the predominant symptoms?	Acute onset GI
Time	When did infection occur?	Friday morning
Place	Where did infection occur?	Office brunch
Person	Who may have been infected	Brunch attendees

Using the information from the line list presented earlier, a case may be defined as "an illness in any person who experienced an acute onset of gastroenteritis after attending the office brunch on Friday, October 17". Persons with ID numbers 1, 2, 3 and 7 may be considered cases based on this proposed definition.

If the definition is later refined to state that a case is "an illness in any person who experienced diarrhea or vomiting after attending the office brunch on Friday, October 17", then only persons with ID numbers 1, 2, and 3 will be classified as a case for this outbreak. Person with ID number 7 did not report diarrhea or vomiting, therefore does not meet the refined definition of a case.

The case definition may be even further refined if samples are obtained and tested and an etiologic agent is identified. Thus, the case definition may be all cases with *Salmonella* Newport and a matching PFGE pattern.

Case finding.
Methods for case finding will vary according to the disease in question and the community setting. When an outbreak is first recognized, investigators should attempt to "cast the net wide" to determine the extent of the outbreak and identify additional cases. Most outbreaks involve certain clearly identifiable groups at risk, therefore, finding cases will be relatively self-evident and easy.

Case finding methods might include the following:

- Asking affected persons to provide the names and contact information of other ill persons
- Directly contacting physicians' clinics, hospitals, laboratories, schools, or nursing homes, as appropriate
- Alerting the public directly through the media if needed to protect the public's health

The data obtained during case finding can provide clues about the outbreak and potential risk factors associated with illness.

The Questionnaire/Survey.
A common method of finding cases, organizing and analyzing data is to conduct a questionnaire or survey among the population you believe to be at risk, (e.g., attendees of an office brunch). A questionnaire that targets specific questions about foods eaten and symptoms experienced is a valuable epidemiologic tool. A questionnaire is solicited to those ill and well, associated with the incident, and assists in developing better hypotheses about the etiologic agent's identity, source, including the means and time of transmission.

Key questions to consider when developing a questionnaire:

- What are the demographic characteristics of the individual? (name, age, sex, race, occupation, home and work addresses, phone numbers)
- Was the individual exposed to the suspected source and when?
- What are the symptoms, date of onset, their order of occurrence and duration?

- What medical treatment has been sought and received? Hospitalized? Received any antibiotics?
- Is there a diagnosis or laboratory results?
- Who else has been exposed to a case during his or her infectious period? (secondary contacts)
- What foods were consumed in the last 72 hours (or other appropriate time frame) before the time of onset. It is also important to interview and obtain food histories from those who ate the same suspect food and did not get sick.
- Any other potential exposures, including specific activities

When possible, a menu should be obtained, and specific food items, including ice, should be listed in the exposure or risk factor section. This will help with recall of food items eaten.

A questionnaire template should be created ahead of time and modified to fit the specifics of a given outbreak. These questions are intended as a guide. They will require modification to fit the particular circumstances surrounding the investigation. Examples of questionnaires that can be used or modified for use can be found in **Appendix C**.

Tips on how to conduct open ended questions are also available in **Appendix C**.

Describe the outbreak by Time, Place, and Person – Descriptive Epidemiology

"What does it all mean?"

The purpose of this step is to arrange all the incoming data so that it means something. At this stage we are searching for common associations based on TIME, PLACE, and PERSON to strengthen or amend current hypotheses. Several tools can be utilized to help organize and depict the outbreak including epidemic curves, maps, and frequency tables.

Epidemic Curves

An epidemic curve is a graph that depicts the association of the time of illness onset of all cases that are associated with the outbreak. It helps to determine whether the outbreak originated from a common source or person to person. Time is plotted on the horizontal axis and the number of cases plotted on the vertical axis.

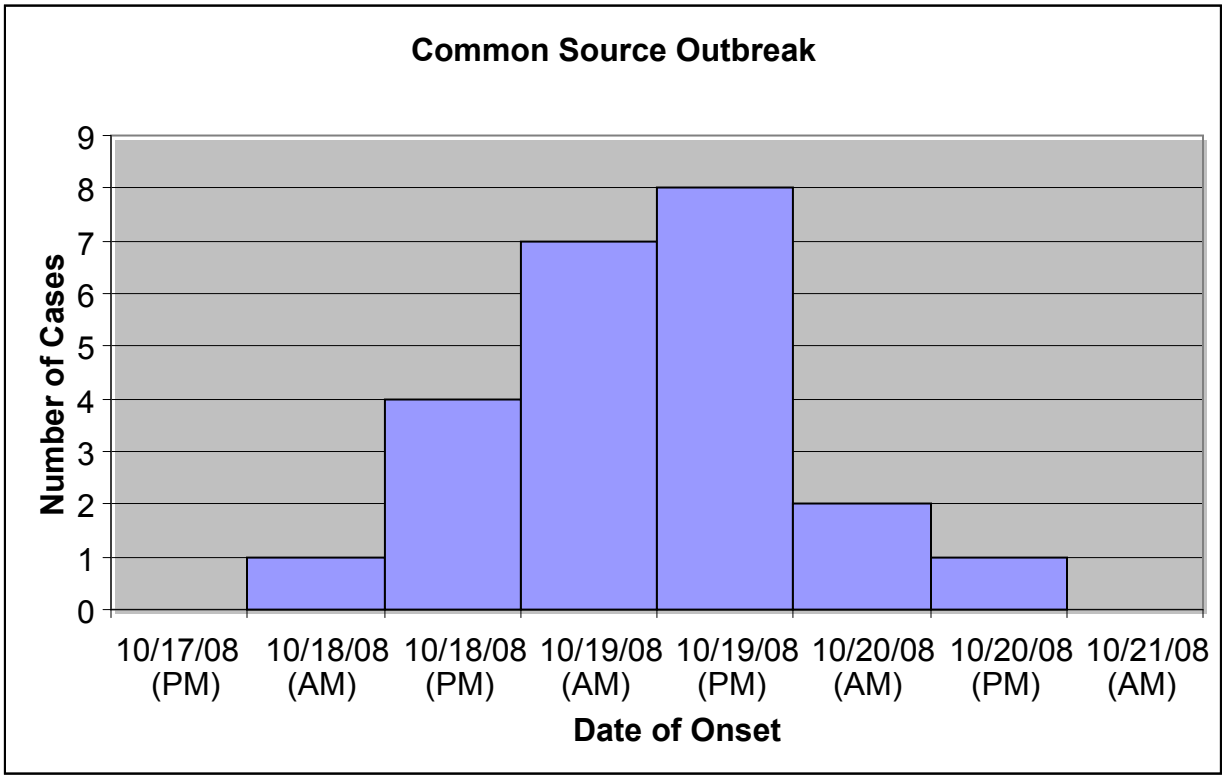
The shape of an epidemic curve may suggest what kind of outbreak is occurring. A *common-source* or *point-source outbreak* looks different from a *propagated-source* or *person-to-person outbreak* and a *continual source outbreak*. Investigators can use an epidemic curve to determine where they are in the course of an outbreak – is the outbreak on an upswing, on the down slope, or has the outbreak ended? An epidemic curve also helps to filter out "background noise" or outliers that may be "red herrings' and are not associated with the outbreak.

Definitions of the three most common types of outbreaks as well as examples of each epidemic curve can be found on the following pages.

Refer to **Appendix C** for more information about how to create an epidemic curve.

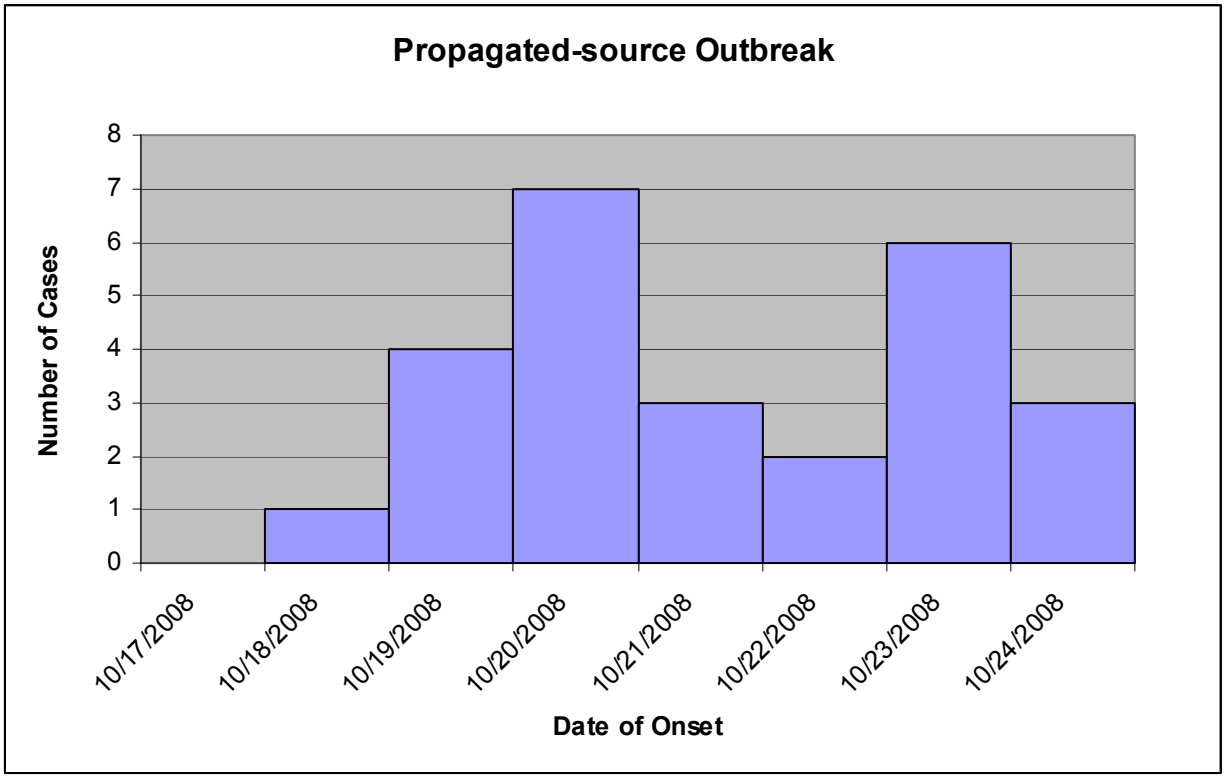
Common-source or point-source outbreak.

An outbreak of disease or illness which occurs when individuals are exposed to some source of infection at the same time. For example, co-workers at an office pot-luck brunch. Foodborne disease outbreaks are most often point-source outbreaks. The epidemic curve for this type of outbreak is characterized by a sharp rise in the number of cases that slowly tapers off. Most illness appears within one incubation period.



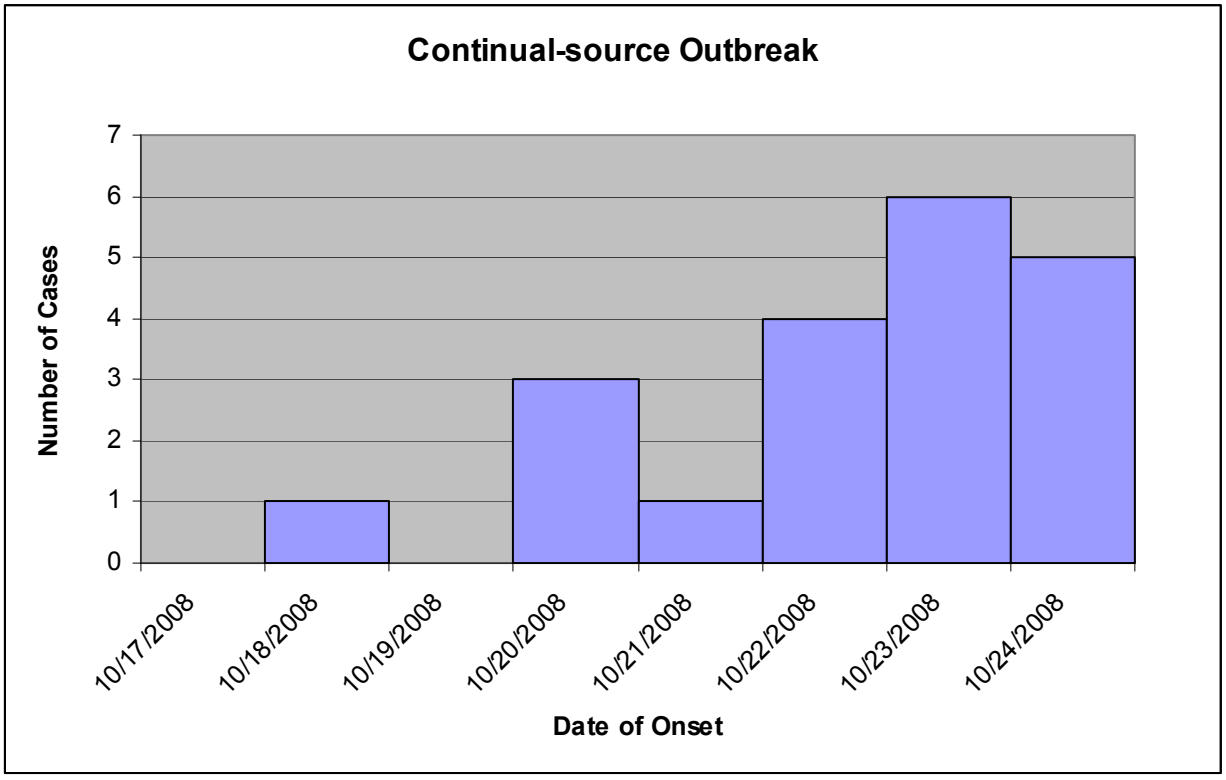
Propagated-source or person-to-person outbreak.

An outbreak of disease or illness that is spread from one person to another via the fecal-oral route. For example: a Norovirus outbreak at a nursing home or a Shigellosis outbreak at a daycare facility. Infection will often spread from one person to another because of poor hygiene/handwashing and inadequate disinfection. The epidemic curve for this type of outbreak is characterized by progressive peaks and the curve will continue for the duration of several incubation periods.



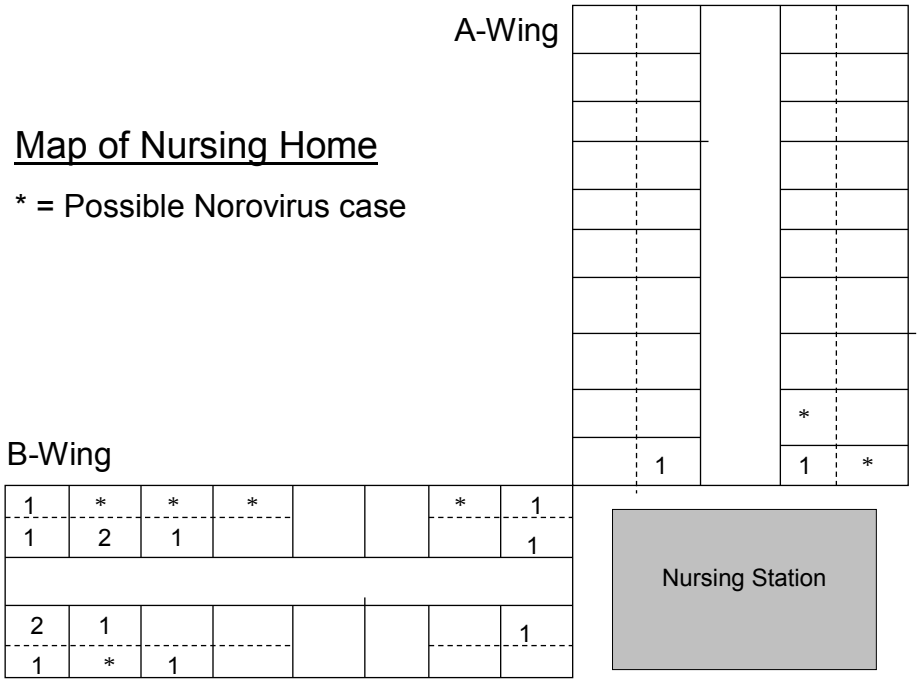
Continual-source outbreak.

An extended outbreak of disease or illness that occurs when a source remains contaminated and individuals continue to be exposed to this source. For example: an outbreak where food is continuously contaminated by an infected food handler or an outbreak when a community continues to use water from a contaminated well. The epidemic curve for this type of outbreak is characterized by a gradual rise in the number of cases and will often plateau. There may also be continual peaks over time.



Maps and pictures.
Sometimes diseases occur or are acquired in unique locations in the community, which, if you can visualize, may provide major clues or evidence regarding the source of the agent and/or the nature of exposure. Maps and pictures can be helpful in showing the geographical location or layout of the place in which an outbreak has occurred. This spatial information may be crucial to the outbreak investigation and may provide clues about the source of the outbreak.

The “spot map” is a pictorial of the spatial distribution of illness within a specific setting or area. In the following example, ill individuals are plotted onto a map of a local nursing home facility. The number of cases are listed for each room. The cluster of cases may indicate where the outbreak originated and how it is spreading. It can also assist in determining where targeted disinfection measures would be most appropriate. Other spot maps, such as maps of geographical areas, place of employment or school attended, may also be useful depending on the situation.



Frequency Tables.
Frequency tables may be used to summarize the different attributes of the cases and may provide information related to person. By analyzing the descriptive data, a special characteristic may be identified among a majority of the cases which may assist investigators with potential exposures.

Frequency Table Example:

Characteristic	Number of Cases (%) (N=50)
Age	
< 1 year	15 (30)
1 to 4 years	25 (50)
5 to 19 years	5 (10)
20 to 49 years	5 (10)
50+ years	0 (0)
Sex, Male	26 (52)
Race	
White, non-Hispanic	22 (44)
Hispanic	20 (40)
Native American	5 (10)
Asian	3 (6)

This table shows that of the 50 cases identified, the majority (80%) are under the age of five. Investigators should therefore consider exposures that mainly affect persons of this age group such as daycare attendance or foods or drinks commonly consumed by young children.

Implement control and prevention measures

"What can be done *now* to stop the spread of infection?"

The priority during each investigation should be to implement effective control measures. This should be done early in the course of the investigation based on the initial hypotheses. Control measures should focus on specific agents, sources, or reservoirs of infection and should be targeted to interrupt the transmission of disease or reduce exposure to disease. Some important control and prevention measures related to foodborne disease outbreak may include, but are not limited to, the following:

- Removal of contaminated food
- Exclusion and restriction of individuals who are at high risk of spreading illness, including food handlers, day care attendees and providers, and persons involved with direct patient care
- Emphasizing good handwashing or hygiene techniques
- Closing the food establishment, if implicated and necessary

As additional information becomes available, corresponding measures should also be taken as needed:

- Hosting conference calls with key agencies and investigators to discuss and coordinate the public health response
- Sending notices (e.g., via the Health Alert Network – HANs) to other counties, healthcare professionals, schools, daycares, or nursing homes and other entities about the public health recommendation

- Developing a press release to educate the public about protecting oneself from foodborne illness

These measures should be instituted as soon as possible to control the current problem and demonstrate to the community that efforts are being made to control the problem.

Develop possible hypotheses

"What might have caused the illness?"

A hypothesis is an educated guess about the cause of the outbreak and the factors that may have contributed to illness. Hypothesis generation can begin as early as the initial phone call and will continue to be refined as the investigation proceeds. One example of a simple hypothesis is: the cases became ill after sharing a common meal.

By knowing the symptoms experienced, the incubation period, the recovery period, the food items served, the biological plausibility of pathogens, and the tools used to organize the outbreak information provide invaluable clues about the source and cause of illness. Once the population at risk has been determined, appropriate control measures can be targeted. Hypotheses may need to be revised during the outbreak investigation as new information becomes available.

Note: **Appendix F** provides a table that lists foodborne illnesses and their corresponding incubation periods, signs and symptoms, recovery periods, and foods typically associated with illness. This table may be useful in developing hypotheses related to foodborne disease outbreaks.

Plan and conduct an epidemiologic study to test hypotheses

"Why, how and where did illness occur?"

To test or prove your hypothesis, you want to apply more analytical techniques, such as statistical testing. The steps conducted thus far have mainly focused on ILL individuals. However, a thorough outbreak investigation depends on comparing exposures or risk factors among those who are ill and those who are not ill. These comparisons help to determine what happened, to identify what may have caused disease, and to recommend what can be done to prevent illness in the future.

The study design and questionnaire utilized are important tools to further analyze the outbreak and make comparisons and thus, special care should be taken when designing the questionnaire, determining the appropriate study design, and organizing the logistics of carrying out the outbreak investigation.

Study Design.
The two types of studies most commonly used in foodborne outbreak investigations are retrospective cohort studies and case-control studies.

Retrospective Cohort Studies
Cohort studies are often conducted for outbreaks involving a well-defined group of individuals (such as parties, worksites, cruises). The investigator develops a questionnaire and

retrospectively collects exposure and illness information from all persons in the group. Each person reports what exposures he or she had and whether or not they became ill following the exposures. The investigator then analyzes the data collected to assess which exposure(s) are associated with the highest risk of illness. When we conduct a cohort study we are asking the question: what is the risk of disease in exposed individuals compared to the risk of disease in non-exposed individuals? To evaluate this we use the relative risk ratio (the ratio of the attack rate for ill persons who were exposed and the attack rate for ill persons who were not exposed).

For example, 50 individuals attended and office potluck brunch, and many of the attendees consumed the food items served at this event. A few days later several attendees reported symptoms of diarrhea, vomiting, and abdominal cramping.

In this scenario, a well-defined group of individuals attended and ate food at an office brunch. Some of the attendees subsequently reported illness following the shared experience. Based on this information, the investigator may conduct a retrospective cohort study to determine how many of the 50 persons experienced illness after the brunch and to identify the specific food item(s) associated with illness.

NOTE: **Appendix C** contains information on basic data analysis including how to calculate frequencies, attack rates, relative risks and odds ratios. In addition there is a glossary of terms located in **Appendix A**.

Case-control Studies

A case-control study is appropriate for outbreaks in which individuals are not part of a well-defined group of individuals. During a case-control study, the investigator develops a questionnaire that is to be administered to persons with disease ("cases") as well as persons without disease ("controls"). Both groups of individuals are then asked to answer questions about specific exposures they may have had. The investigator analyzes the data and compares the odds of having an exposure among the cases versus the odds of having an exposure among the controls. When we conduct a case-control study we are asking the question: what are the odds that a case was exposed? To evaluate this we use the odds ratio.

For example, ten cases of *Salmonella* Heidelberg were reported by a local hospital to County Y. Because County Y normally observes only one salmonellosis cases during a one-month period, the investigator suspected that an outbreak had occurred. Case investigations were conducted, and the preliminary information revealed that seven of the ten cases reported eating at Restaurant A in the week before becoming ill.

In this scenario, the total number of persons at risk is unknown and not well-defined. The investigator has no means of knowing how many persons in the community may have eaten at Restaurant A during that time period. In addition, even though seven of the ten cases mentioned eating at this one specific restaurant, the association between illness and eating at Restaurant A has not yet been well established. Based on this information, the investigator may conduct a case-control study to determine if there is an association between illness and eating at Restaurant A or if another exposure may be linked with illness.

Selecting controls in a case-control study

An essential part of the case-control study is selecting controls with whom the cases may be compared. Ideally, controls should be similar to cases except they do not have the disease.

Controls should also represent the same population as the cases. If a certain exposure is reported more often by cases than controls, then this exposure is considered associated with illness.

Controls may be found in the following ways:

- Credit card slips from the food establishment, if one is implicated
- Neighborhood or individuals from the same community as cases
- Patients from the same physician practice or hospital with a different disease diagnosis
- Friends of cases
- Well persons who ate with the case
- Persons in the phone book who share the same phone prefix

In the above case-control scenario, controls may be found in the community where Restaurant A is located.

Retrospective Cohort Studies *vs.* Case-Control Studies

	Retrospective Cohort Study	Case-Control Study
Similarities:		
Uses questionnaire to gather data	Yes	Yes
Makes comparisons between ill and non-ill persons	Yes	Yes
Evaluates associations between risk factors and illness	Yes	Yes
Differences:		
Population affected	Well-defined	Poorly defined or unknown
Basis for inclusion into study	Common exposure	Presence or absence of illness
Question to be asked	"Did you become ill?"	"Were you exposed?"
Statistical Analysis	Attack Rates Food-specific Attack Rates Relative Risk Ratios Odds Ratios, but less frequently	Odds Ratio

Logistics.

After the questionnaire has been developed and the study design has been selected, the logistics of carrying out the investigation should be considered, including the following:

- For a cohort study, a complete list of the group of individuals and their contact information is needed
- For a case-control study, the method for selecting controls needs to be decided
- If possible, the questionnaire should be tested for clarity prior to administration
- The personnel assigned to the study should become familiar with the questionnaire and any potential questions that may arise – Local Health Department nurses and local or ADHS epidemiologists often share the task of conducting interviews

- A feasible method for administering and distributing the questionnaire should be discussed – self-administered or personal interview? In person, by phone, by mail, by email, or via the internet?
- The data entry program or spreadsheet and method of entering data into the program should be considered

Once a plan of action has been developed, the study should be initiated as soon as possible. It may occasionally be necessary for phone calls to be made after hours or on the weekends. The longer the time lapse between exposure and the request for information the less reliable the poorer the quality of data that might be collected.

Additional studies to supplement the epidemiological study might also be conducted at the same time. These include:

Environmental Studies: These studies often take place in the initial phase of an outbreak investigation to help determine the source of exposure and mode of transmission.

Laboratory Studies: Laboratory analysis is used to confirm that a particular agent or chemical is present in clinical or environmental samples

Analyze the data collected and interpret results

"What does the data tell us?"

Important tasks that should be performed to finalize the data include the following:

- Re-evaluate the case definition and ensure that persons classified as cases meet the case-definition
- Update any epidemic curves previously plotted
- Calculate frequencies and percentages
- Compute the median and ranges for the incubation period and recovery period
- If the study design was a retrospective cohort study, calculate the attack rate, food-specific attack rates, and relative risk ratios
- If the study design was a case-control study, calculate the odds ratios
- Determine if results obtained are statistically significant (e.g., 95% confidence intervals)

Additional information on how to calculate attack rates, relative risk ratios and odds ratios can be found in **Appendix C**.

Following analysis of the data, the results should be interpreted. Information gathered from the epidemiologic investigation should be compared with the findings obtained during the environmental assessment and the laboratory analysis. General knowledge about foodborne illnesses should be collectively used to help explain what happened, what measures should be taken immediately, and what steps should be taken to prevent similar situations from occurring in the future.

Report the findings of the outbreak investigation

"What are the public health lesions learned from this outbreak?"

After analysis of epidemiologic and environmental data, conclusions should be summarized in a report. This is one of the most important steps in the outbreak investigation. Not only does the report detail your agency's efforts, but identifies a potential source(s) of the outbreak and suggests control measures to prevent future illness. In addition, a written report provides an account of the outbreak for potential medical and legal issues, and can improve the quality of future investigations.

Proper reporting of the investigation includes the following:

- Completion of the CDC **NORS (National Outbreak Reporting System) electronic form** (a copy can be found in **Appendix C**) and notification to the Foodborne Disease Epidemiologist at ADHS of the NORS ID. This form is used to report foodborne outbreaks in Arizona to the CDC for national surveillance purposes
- For ALL outbreaks: complete and submit the ***ADHS Outbreak Report Form*** within 30 days of the outbreak closure (located online at: *http://www.azdhs.gov/phs/oids/epi/pdf/outbreakreport.pdf*). This form should be submitted to the ADHS Investigations Epidemiologist via email or over SIREN. A copy of this form can also be found in **Appendix C**.
- Preparing and writing a report that follows a scientific format of introduction, background, methods, results, discussion, recommendations, and supporting documents. **Appendix C** provides more information about writing the final report.
- Dissemination of the preliminary, summary, and final reports as widely as needed. At a minimum, the submitter should retain a copy, and additional copies should be provided to the outbreak investigators (local and at ADHS) and any facility involved in the outbreak. Synopses may also be used for press releases and postings on websites. Publications in local, regional or statewide documents offer wider review, allowing many others to learn from the experience.

INTENTIONAL CONTAMINATION OF FOOD

It is important for investigators to consider intentional contamination of food when unintentional causes do not seem plausible.

From the epidemiologic perspective, the steps required to detect, diagnose, and reduce foodborne illness and outbreaks are the same ones required to prevent, identify, and respond to a terrorist attack on food. Epidemiologists depend upon science-based approaches to identify the cause, risk factor(s), or source of infection and to implement interventions to prevent others from becoming ill.

Unfortunately, foodborne disease outbreaks are common occurrences and attributing the cause of illness to an intentional contamination event can be difficult. Moreover, intentional events may involve diseases or characteristics of diseases that are often investigated. A number of clues may alert outbreak investigators to consider that a foodborne disease outbreak might be intentional.

Epidemiologic Clues
• Unusual agent or vehicle • Multiple unusual or unexplained diseases in a single person • High attack rate or severe outcomes or deaths • Failure of patients to respond to conventional treatments • Multiple exposure sites or vehicles with no apparent link • Many ill persons presenting near the same time • Deaths or illness among animals that may be unexplained and occur before illness in the human population
Law Enforcement Clues
• Intelligence or threat information • Unlawful possession of pathogens by an individual or group • Evidence of a credible threat in a specific area • Identification of literature pertaining to the development or dissemination of a particular agent
Source: International Association for Food Protection. *Procedures to Investigate Foodborne Illness. 5th ed. 1999*. Reprinted 2007.

Investigators in both law enforcement and environmental health will also have to work together to find the answers to the following questions:

- How would perpetrators gain access to food?
- How could a pathogen be introduced?
- How was the agent mixed or distributed?
- How might the pathogen spread in the environment?

Although the epidemiologic approach remains the same regardless if the event is deliberate, these additional steps will need to be performed during the investigation of an intentional foodborne disease outbreak.

- Public health officials should work closely with law enforcement and emergency management agencies at all levels if an intentional event is suspected or identified.
- Local, state, and federal law enforcement agencies should be notified and will be the lead agencies in investigating the criminal activity.
- The ADHS Office of Public Health Emergency Preparedness (PHEP) should be notified in addition to other state and local emergency management agencies.
- Depending on the food vehicle and nature of the threat, other federal agencies that should be notified include the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), the Centers for Disease Control (CDC), and the U.S. Department of Homeland Security.

SECTION IV

THE LABORATORY ANALYSIS

SECTION IV: LABORATORY ANALYSIS DURING OUTBREAK INVESTIGATIONS

The main objectives of laboratory analysis during outbreak investigations are (1) to confirm the clinical diagnosis through identification of the causative agent from human specimens, (2) to ensure proper identification of the disease, and (3) to determine if the causative agent is present in the implicated environmental source, such as food.

General Guidelines for Clinical Specimen Collection

Laboratory identification of a pathogen can validate the hypothesis and allow easier implementation of control and preventative measures. Increased certainty results if the statistical association of illness is combined with the isolation of a pathogen from the ill person ad the implicated food items(s). Therefore, time is of the essence when requesting and collecting clinical and food specimens. Most foodborne infections are diagnosed through the identification of the pathogen in stool collected within 48 to 72 hours after onset of symptoms from infected persons. Vomitus has also been used to detect certain organisms and confirm the etiology. Serology and blood cultures are recommended for the laboratory diagnosis of systemic infections.

Please refer to *Section 7* of the *Guide to Lab Services* (http://azdhs.gov/lab/micro/labguide.pdf) or the *Arizona Food and Waterborne Laboratory Testing Services* manual for additional details for submitting specimens to the ASHL.

Role of the Arizona State Health Laboratory:

The Arizona State Health Laboratory (ASHL) is the reference laboratory where hospitals and other laboratories send specimens or isolates for confirmation and serotyping. In addition to reference laboratory activities, the ASHL examines implicated food and clinical specimens (in outbreak and non-outbreak situations) to identify the organism responsible for human illness. PFGE ("DNA fingerprinting") is also done on all *Salmonella, Shigella, E. Coli* and *Listeria* samples submitted to the ASHL.

Stool Specimens:

Proper collection of stool specimens requires having stool kits readily available, using the appropriate kit for the suspected disease, and encouraging ill persons to submit a stool specimen.

Enteric stool kits can be used to test for *Campylobacter spp., Salmonella spp., Shigella spp., Staphylococcus aureus, Bacillus cereus, Clostridium perfringins*, and Shiga toxin-producing *E. coli*. These kits may also be used for testing of Norovirus. Please note, stool to be tested for Norovirus must be raw stool. It should not be collected using transport media.

These kits should contain:

1. A vial of Cary-Blair transport medium (0.16% agar concentration) (the ASHL can provide Counties with Cary-Blair media if necessary) – Cary-Blair media is intended for the transport of stool to be used for bacterial cultures only.
2. Sterile swabs

3. A collection container or 'hat' (if no hat is available plastic wrap or aluminum foil can be used to collect the stool specimen)
4. One pair of nitrile gloves
5. One plastic spoon or tongue depressor
6. Two plastic biohazard bags or zip-lock bags
7. One specimen cup
8. Absorbent sheets to place in with specimens
9. Instruction sheet

O&P stool kits can be used to identify intestinal parasites, including *Cryptosporidium parvum, Cylospora cayetanensis, Entamoeba histolytica,* and *Giardia lamblia*.

These kits should contain:

1. A vial of formalin and a vial of polyvinyl-alcohol (PVA)
2. A collection container or 'hat' (if not hat is available plastic wrap or aluminum foil can be used to collect the stool specimen)
3. One pair of nitrile gloves
4. One plastic spoon, tongue depressor or sterile swab
5. One plastic biohazard bag or zip-lock bag
6. Sheet of absorbent material (to place in bag)
7. Instruction sheet
8. Rigid outer container (cardboard box) to place bagged specimens into for transport

It is recommended that at least 5 kits (enteric and O&P) are kept on hand at each local health department. The transport media has an expiration date, so rotation or replacement is essential. The Arizona State Health Laboratory can provide agencies with transport medium.

Distributing Stool Kits and Obtaining Stool Specimens:

The following list describes the general steps that a local health investigator should take to obtain stool specimens from ill persons. For specific examples please see **Appendix D.**

1. Provide one stool kit to persons experiencing diarrhea, defined as three or more loose stools within a 24-hour period. In outbreak situations, stool specimens from five to eight ill individuals are ideal.

2. Collect the name and DOB of the person submitting the specimen and pre-label the cups/vials. This ensures unlabeled specimens don't arrive at ASL and helps prevent the possibility of sample rejection.

3. Instruct the ill person to use the collection container in the toilet under the seat (If using plastic wrap or aluminum foil the lining should be placed under the toilet seat and pushed slightly down in the center, but not touching the water, creating a 'bowl' in which the specimen may be collected). The person should pass feces directly into the collection container (or onto the lining). Prior to passing feces, the person should try to urinate so as not to mix the fecal specimen with urine.

4. If a bacterial agent is suspected, provide an enteric kit with Cary-Blair media.
    a. A sterile swab should be used to swab the raw stool. The swab should then be placed in the tube of transport media and tightly closed (If no swab is available a

plastic spoon or tongue depressor can be used to transfer the stool to the tube of transport media).
   b. Keep the vial refrigerated until shipped.

5. If Norovirus is suspected, provide an enteric kit with a specimen collection cup.
   a. Stool for Norovirus testing should be collected in *raw* form.
   b. Using a plastic spoon or tongue depressor, transfer as much stool as possible into the specimen cup (don't over fill) and tightly close the specimen cup, place into a plastic bag and refrigerate immediately.

6. If a parasite is suspected, provide one O&P kit.
   a. Collect one spoonful of stool for each vial (formalin and PVA). The fecal material should be put in the preservative as soon as it is passed. Instructions should clearly state to use no more than one spoonful of stool per vial.
   b. Gently shake the vials so the stool mixes with the liquid and then place in a plastic bag and keep at room temperature (do not refrigerate).
   c. Instructions should clearly state that the collection media for O&P kits are toxic and should not be ingested or disposed of down the drain.

7. After the specimen has been collected, the person should dispose of the excess material into the toilet and discard the soiled materials used.

8. The local health department should arrange for pick up or have the specimens mailed as soon as possible.

9. Contact the ADHS Foodborne Disease Epidemiologist at (602) 634-3676 or by email and provide the epidemiologist with the names of the persons for whom specimens will be submitted for testing at ASHL.

10. Fill out the ASHL Laboratory Specimen Submission Form for each specimen obtained. Under the "Comments Section", indicate that the specimen is associated with an outbreak and that ADHS has been notified. The fields required for specimen processing include: patient first and last name, age, sex, submitting agency name, specimen collection date, and specimen type. Refer to **Appendix D** or the ASL website (*http://www.azdhs.gov/lab/micro/submissionform3.pdf*) for a copy of the Laboratory Specimen Submission Form. In the patient ID box at the top of the form - adding the name or identification number of the outbreak will allow you to easily sort incoming lab results into the proper places.

Vomitus Specimens

Vomitus can be tested for viruses and certain bacterial toxins. Specimens should be collected as soon as possible after onset of illness.

Obtaining Vomitus Specimens

The following are guidelines describing the steps that a local investigator should take to obtain vomitus specimens from ill persons.

1. Instruct the ill person to vomit directly into a sterile specimen container, such as a screwcapped jar or cup (a urine specimen container works well). If this is not possible, vomit in a container, bowl or plastic bag and transfer the vomitus to the screwcapped container with a clean spoon.

2. Place the cap securely on the container and tape the lid in place.

3. Place the container in a plastic zip-lock bag.

4. Refrigerate until shipped. Do NOT freeze.

5. Contact the ADHS Foodborne Disease Epidemiologist at (602) 634-3676 or by email and provide the epidemiologist with the names of the persons for whom specimens will be submitted for testing at ASHL.

6. Fill out the ASHL Laboratory Specimen Submission Form for each specimen obtained. Under the "Comments Section", indicate that the specimen is associated with an outbreak and that the ADHS has been notified. The fields required for specimen processing include: patient first and last name, age, sex, submitting agency name, specimen collection date, and specimen type. Refer to **Appendix D** or the ASL website (*http://www.azdhs.gov/lab/micro/submissionform3.pdf*) for a copy of the Laboratory Specimen Submission Form.

General Guidelines for Food Sample Collection During an Outbreak Investigation

Microbiological analysis of food supports the epidemiologic investigation of a foodborne disease outbreak. The purpose of testing is to isolate and identify pathogenic microorganisms in food samples, which have been implicated in the outbreak. Samples collected as part of the investigation should be treated as official samples and should be collected in a manner that reflects the food as it was prepared, served, or used in preparation of the suspected meal.

Submission of Food Samples for Analysis at ASHL:

Food sample collection is most often conducted by a food inspector. Occasionally, ill individuals will have food samples that can be brought to the local health department (LHD). However, requests for laboratory examination of food or food-related samples should be made through the ADHS Office of Infectious Disease Services. Laboratory examination of food will typically occur after a foodborne pathogen has been detected in clinical specimens. Results of food analysis will be reported to the ADHS Office of Infectious Disease Services and the LHD responsible for submission.

Method for Collecting Food Samples:

The value of laboratory results depends on the quality of the samples submitted. Suspected foods should be collected as early in the investigation as possible. Food samples must be collected using aseptic techniques and appropriate containers. Samples must be refrigerated during storage and transport and should arrive at the food microbiology laboratory

within three days of collection. Samples collected frozen should be stored and transported frozen on dry ice.

See Chapter 1 of the *Bacterial Analytical Manual: Food Sampling and Preparation of Sample Homogenate* for general information on sample collection storage and shipping. (http://www.fda.gov/Food/ScienceResearch/LaboratoryMethods/BacteriologicalAnalyticalManualBAM/ucm063335.htm)

The following are guidelines that should be taken when collecting food samples:

1. Whenever possible, food samples should be submitted in the original container as contamination of a sample may occur during manipulation.

2. If the food is a solid food item and shipping in the original container is not feasible, a representative sample should be taken. Take a sample from the geometric center and also take samples from several other locations in the food item.

3. If the food item is liquid and shipping in the original container is not feasible, stir or shake the liquid food item and pour or ladle the sample into a sterile leak-proof container.

4. Samples collected that are not in their original container should be collected using sterile collection implements and sterile collection containers that are leakproof.

5. Collect an adequate amount of the food sample—a minimum of 4-6 ounces or 100 grams (1/4 pound), if possible.

6. Fill containers no more than ¾ full and use adhesive tape to seal containers.

7. Keep food cold by placing in styrofoam coolers with ice packs.

8. Clearly document how the product was handled and who handled it after the sample is taken.

9. Fill out the ASHL Bacterial Food Analysis Form for each food specimen submitted. In the "Comments Section", indicate that the specimen is associated with an outbreak and that the ADHS has been notified. Refer to **Appendix D** for a copy of the Bacterial Food Analysis Form.

Labeling Food Samples:

Information about the food samples should be properly documented, including the following

- Name and type of product
- Brand of product
- Product manufacturer and code or lot number
- Inspector name
- Date, time, and place of collection
- Establishment name

Recommended List of Sampling Equipment:

- Sterile sample containers
  - Plastic bags (Whirl-Pak) and sponges
  - Screwcapped jars or tubes
- Sterile individually wrapped sample collection implements
  - Spoons
  - Knives
  - Spatulas
- Supporting equipment
  - Individually wrapped disposable gloves
- Sterilizing and sanitizing agents
  - Alcohol swabs
- Refrigerants
  - Ice pack
  - Thermometer
  - Insulated container (Styrofoam cooler)

Laboratory Testing and Interpretation:

With some microbial agents of foodborne disease, it is necessary that large numbers of the organisms be present in a food for it to be hazardous. Examples of these agents include: *Bacillus cereus, Clostridium perfringens* and *Staphylococcus aureus*. Usually 10^6 organisms per gram of food are necessary before there is a danger of food poisoning from these agents. For these kinds of agents the laboratory reports the number of organisms present per gram of food, and whether or not this would be considered a significant level. For *Staphylococcus aureus*, the current method is to screen for enterotoxin first. Culturing for the organism will occur only if necessary.

With other bacteria, any number of organisms present in a ready-to-eat food may be significant. Examples of such agents include: *Salmonella, Shigella, E. coli O157:H7, Campylobacter*, and *Yersinia*. For these kinds of agents, the laboratory reports their presence or absence. Their presence in a ready-to-eat food should be considered significant.

Chain of Custody:

Chain of custody establishes how environmental samples are collected, shipped, and received by ASHL. These procedures ensure that samples collected during an epidemiological investigation are valid, maintained under proper control, and their handling is documented so that any analytical results are viewed as reliable during any legal proceedings that may result from the investigation. The validity of sampling procedures as well as the handling of samples is increasingly under scrutiny in legal cases resulting from foodborne illness investigations. Chain of custody procedures begins with sample collection and follows the sample through until its destruction by the laboratory.

A sample is in someone's "custody" when:

1. It is in one's actual physical possession;
2. It is in one's view, after being in one's actual physical possession;

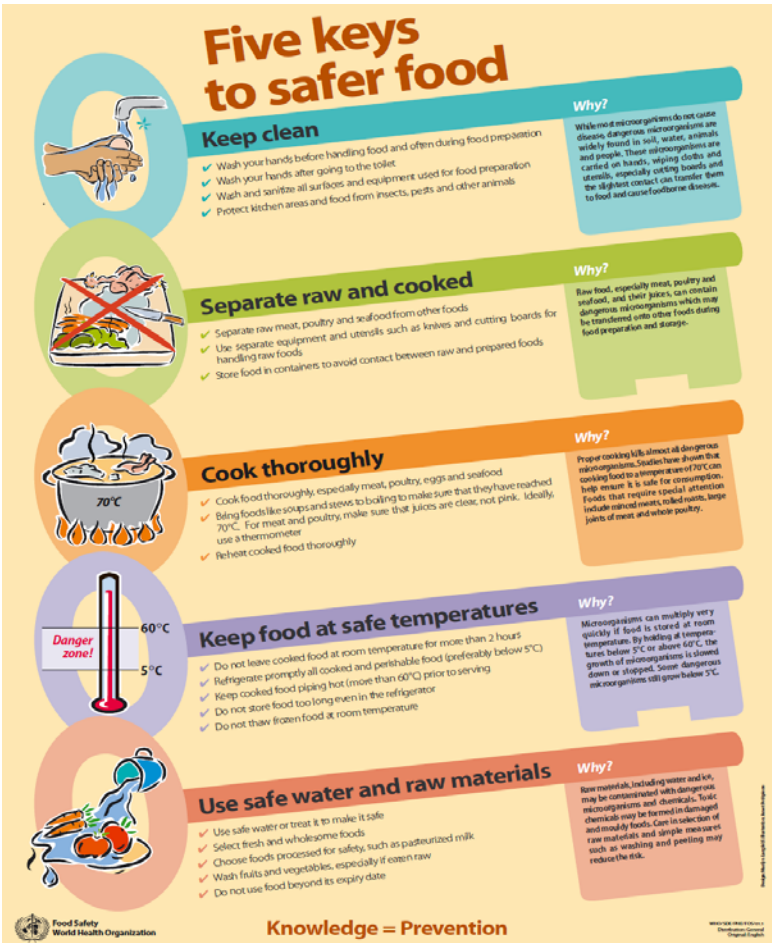
3. It is in one's actual physical possession and then locked up so that no one can tamper with it; or
4. It is kept in a secured area and restricted to authorized personnel only.

The chain of custody should be described on a separate form and include the following:

1. Indicate when (date and time), where and from whom the sample was obtained.
2. Describe where the sample had been kept and what type of container it had been stored in (i.e. plastic bag in consumer's refrigerator).
3. Describe where and how the sample was held while in the custody of the food inspector and local health department and how it was transported to the lab.
4. Include signatures and dates from all persons who had custody of the sample during transfers to the lab.

SECTION V

THE ENVIRONMENTAL ASSESSMENT



FUNDAMENTAL CONCEPTS OF FOOD MICROBIOLOGY

Familiarity with certain fundamental concepts related to food microbiology is essential to understanding the steps of an environmental outbreak investigation. Such concepts include potentially hazardous foods and the three main hazard categories.

Potentially Hazardous Foods:

> **Potentially Hazardous Foods** (PHF) include any food or food ingredient (natural or synthetic) that is capable of supporting rapid and progressive growth of microorganisms. Examples of PHFs include beef, poultry, pork, shellfish, dairy products, eggs, some raw or cooked vegetables, and starchy foods (tofu, rice, potatoes, grains).

Certain conditions favor the growth of foodborne microorganisms within the environmental setting. Such conditions include the food, acidity, time, temperature, oxygen and moisture, collectively known as FAT TOM. (**NOTE**: Viruses and parasites cannot multiply in food or produce toxins.)

The following table describes the concepts of FAT TOM.

Condition	Explanation
Food	Nutrient-rich foods provide a good environment for microorganisms to thrive
Acidity	Bacterial growth is best in neutral or slightly acidic environments – foods with a pH range between 6.6 and 7.5
Time	Microorganisms proliferate if placed in optimal temperatures for longer than two hours
Temperature	Microorganisms thrive in the “danger zone” (temperatures between 41°F and 135°F) and some thrive in refrigerated temperatures
Oxygen	The presence or absence of oxygen influences growth of microorganisms
Moisture	Moisture content in foods influences microbial growth – high water activity (>0.86) supports rapid growth

The optimum growth temperature range for most pathogens is between 60°F and 120°F. When bacterial spores are heat shocked into a vegetative state and the contaminated food is held at this temperature range, the bacteria can double in number every 15-20 minutes. Some pathogens, such as *Staphylococcus aureus* and *Bacillus cereus*, can also produce heat-stable toxins when the contaminated food is stored at optimum growth temperatures. These toxins, which cannot be destroyed by heating, can remain toxic even after reheating. Other pathogens, particularly *Listeria monocytogenes*, proliferate when placed under refrigeration temperature ranges. Most foodborne pathogens survive but do not grow, at below freezing temperatures and are destroyed at temperatures above 135°F.

High-Risk Factors in Food Preparation:

Though some foods possess conditions that increase the likelihood of contamination, non-PHFs can still become contaminated and cause foodborne illnesses. Certain risk factors or practices and procedures pose the greatest potential for foodborne illness. The following list provides the three hazard categories and highest risk factors as determined by the CDC and FDA.

Contamination hazard

- Food Source
  - Food from unapproved or uninspected source (e.g., unpasteurized milk)
  - Adulterated food
- Cross-Contamination
  - Raw meats not separated from ready-to-eat foods
  - Equipment not properly cleaned and sanitized
- Poor personal hygiene
  - Lack of appropriate hand washing
  - Bare hand contact with ready-to-eat food
  - Ill food workers
- Environmental contamination
  - Improper storage, labeling, or usage of chemicals
  - Presence of insects or rodents
  - Lack of potable water
  - Improper sewage disposal

Survival hazard

- Inadequate cooking
- Improper reheating temperatures

Growth/Toxin production hazard

- Improper holding
- Unsafe cooling or inadequate refrigeration
- Improper cold/hot holding temperatures
- Preparation several hours before serving

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CONDUCTING AN ENVIRONMENTAL ASSESSMENT

Environmental investigations (often also referred to as food or sanitary investigations) are conducted in parallel with epidemiological and laboratory investigations to find out how and why an outbreak occurred and, most importantly, to institute corrective action to avoid similar occurrences in the future. The specific objectives of an environmental investigation during a foodborne disease outbreak include:

- Identifying the source, mode and extent of the food contamination;
- Assessing the likelihood that pathogens survived processes designed to kill them or to reduce their numbers;
- Assessing the potential for growth of pathogens during food processing, handling or storage;
- Identifying and implementing corrective interventions.

An environmental investigation performed in the context of a foodborne disease outbreak differs significantly from a routine regulatory inspection carried out to identify regulatory violations. These investigations should be carried out by environmental personnel who are familiar with outbreak investigations and familiar with the epidemiological response. Outbreak-related environmental investigations should be guided by data as it becomes available from other components of a multi-disciplinary investigation. Such investigations should attempt to clarify the actual conditions at the time the suspected foods were prepared (i.e. before the outbreak) rather than simply observe the current conditions. Each suspect food item that has been (or could be) implicated in the outbreak should be thoroughly investigated.

Examples of records that may be useful in an investigation include:

- Menus, recipes or product formulations
- Processing records
- Purchasing and inventory records
- Shipping records and other documentation relating to the source of an implicated product
- Hazard analysis and critical points (HACCP) plans and records
- Records of corrective actions
- Flow diagrams
- Floor plans of the establishment
- Complaint records
- Cleaning records
- Food laboratory testing results
- Past inspection records
- Personnel records (including who was working when, and absenteeism)

Steps of an Environmental Assessment during an Outbreak Investigation:

Similar to epidemiologic investigations, some of the steps may occur simultaneously depending on the situation. Each foodborne disease outbreak is unique, but following an established protocol may help ensure procedural uniformity.

Steps of an Environmental Assessment

1. Determine that an outbreak has occurred.
2. Contact and coordinate with key personnel.
3. Conduct food establishment inspection within 24 hours.
4. Conduct a Hazard Analysis Critical Control Point (HACCP) Inspection as directed.
5. Report findings.
6. Revisit establishment and conduct after action meeting.

STEP 1. Determine that an outbreak has occurred.

Many of the foodborne disease outbreaks in AZ are identified through foodborne illness complaints reported by private citizens to the food inspection programs at local health departments.

During the initial phone call with the complainant, it is important to obtain as much information as possible to determine if a foodborne disease outbreak has occurred. Information that should be collected includes the following:

- Date complaint received
- Complainant's name and contact information
- Establishment name and address
- Date and time person(s) ate at establishment
- Date and time of illness onset
- Symptoms experienced by ill person(s), including diarrhea, vomiting, nausea, abdominal cramps, fever
- Total number of persons reporting illness
- Of those reporting illness, number of households involved
- Of those reporting illness, any medical visits, hospitalizations, stool specimens collected
  - The name, address, and phone number of the providers who collected the specimens
- Total number of persons in the group, including those who did not become ill
  - Contact information for all parties
- General food items eaten
- Any food items available for testing
- Any other common activities or meals shared during the three days prior to illness

As stated in Section 2, a foodborne disease outbreak is defined as one of the following:

1. Two or more individuals (from different households) who experience a similar illness after eating a common food or different food from a common place. This includes multiple foodborne illness complaints about the same facility within a 14-day time period.

2. An unexplained, unexpected increase of a similar illnesses where food is a likely source. Medical investigators and epidemiologists at ADHS are available at (602) 364-3676 to assist food inspectors with determining if an outbreak has occurred.

STEP 2. Contact and coordinate with key personnel.

A successful investigation requires a teamwork approach and collaboration with key personnel. Early communication ensures that all steps in an epidemiologic investigation and environmental assessment are conducted in a timely manner.

If one of the definitions of a foodborne disease outbreak is met, the food inspector should contact and coordinate efforts with the following personnel:

- Supervisor
- Local health department epidemiologist
- Regulatory agencies such as FDA and USDA as needed
- ADHS Foodborne Epidemiologist and Environmental Health Services as needed

STEP 3. Conduct food establishment inspection within 24 hours.

When a foodborne illness complaint is reported, a food inspector should conduct an inspection of the food establishment within 24 hours of receiving the complaint. Often times, complaints are reported days after food is consumed. Nonetheless, timeliness is still important. The purpose of the food inspection is to identify high-risk food preparation and handling practices, to enforce safe food handling practices, and to support the epidemiologic investigation.

Identifying High-Risk Food Preparation and Handling Practices:

During the assessment, the inspector should identify factors which may increase the likelihood of contamination, the survival of etiologic agents, and the growth or production of toxins in potentially hazardous foods. (Refer to “Fundamental Concepts of Food Microbiology” for more information.) The information gathered may provide clues about the potential sources of infection and modes of contamination.

Occasionally, the food inspection may reveal that a food item may have become contaminated even before arrival to the food service establishment. In these instances, it is important to trace the implicated food item backwards through the production and distribution chain to identify the contaminated item and remove it from the food market.

Important information that food inspectors should collect when conducting a traceback investigation include the following:

- Label and package information
- Product name
- Package code/lot number
- Expiration/sell by/use by date
- Product size/weight
- Date of purchase
- Manufacturer name and address
- Distributor name and address (invoice information)
- All retail food establishments where purchased
- Whether or not food is an imported product

Supporting the Epidemiologic Investigation:

During the food inspection, the inspector should conduct several tasks to support the epidemiologic investigation. These include (1) interviewing the manager and employees, (2) obtaining a copy of the menu, and (3) collecting food/environmental samples.

1. Interview the manager and employees

The inspector should verify the number of employees working at the facility and ask about any illnesses observed or reported among the establishment employees. All food-handlers who were directly involved in producing, preparing or handling suspect foods should be interviewed. Information should be obtained about the exact flow of the suspect food, its conditions when received by each food-handler, the manner in which it was prepared or handled, and any unusual circumstances or practices prevailing during the relevant period. Recent illnesses of food-handlers (before, during or after the date of the outbreak exposure) and times of absence from work should also be noted. Specimens for microbial analysis should be obtained from any food-handlers who are ill. If assistance is needed in interviewing or collecting specimens from employees, collect the employees name and phone number and provide to the epidemiologist. (To better identify ill food handlers and their specific food handling duties, there is a "Gastroenteritis Surveillance Form for Employees" that the inspector can provide to all employees. This process has proven to be useful in several outbreaks and allows for more honest responses from the employees. Refer to **Appendix E** for a copy of the form and related guidance.)

NOTE: As previously mentioned, the key players in outbreak investigations have the crucial responsibility of maintaining confidentiality of the individuals involved in the outbreak. Identifying information should never be released unless needed to properly conduct the outbreak investigation and protect the public's health. Extreme consideration should be taken to ensure that information is released only on a "need-to know" basis.

2. Obtain a copy of the menu

The menu provides a list of the specific food items that may have been consumed. This list may be used to develop the epidemiologic questionnaire and will help respondents remember the food items eaten.

3. Collect food and environmental samples

Food samples

The food inspector should collect samples of suspect food(s), if still available. Targeted sampling and laboratory testing of foods should be directed by epidemiological and environmental investigations. If an implicated food has not been identified at the time of sampling, a large number of specimens may be collected and stored for subsequent laboratory testing as additional information becomes available. Methods for collecting and submitting food samples are discussed in Section 4.

Food samples that may be appropriate for collection and testing include:

- Ingredients used to prepare implicated foods
- Leftover foods from a suspect meal
- Foods from a menu that has been implicated epidemiologically

- Foods known to be associated with the pathogen in question
- Foods in an environment that may have permitted the survival or growth of microorganisms

If a packaged food item is suspected of being involved in an outbreak, it is particularly important to collect unopened packages of that food – ideally, from the same lot. This can help establish whether the food was contaminated before its receipt at the site of preparation. If no foods are left from a suspect meal, samples of items that were prepared subsequently but in a similar manner may be collected instead, although findings from these tests must be interpreted with care. Any ingredients and raw items that are still available should also be sampled.

Environmental samples
The purpose of collecting environmental samples is to trace the sources of, and evaluate the extent of contamination that may have led to, the outbreak. Samples may be taken from work surfaces, food contact surfaces of equipment, containers, and other surfaces such as refrigerators, door handles, etc. Swabs can also be taken from tables, cutting boards, grinders, slicing machines and other utensils that had contact with the suspect food. Environmental samples may also include clinical specimens from food workers and water used for food processing.

STEP 4. Conduct a Hazard Analysis Critical Control Points (HACCP) Inspection.

In response to the foodborne disease outbreak notification, the food inspector may need to conduct a Hazard Analysis Critical Control Points (HACCP) inspection as directed.

HACCP (pronounced HAS-SIP) is a systematic approach to the identification, evaluation, and control of food safety hazards.

State and local food inspectors are trained to conduct a HACCP inspection, a science-based method of evaluating food handling procedures to identify hazards within the flow of food in an establishment. During a HACCP inspection, the food inspector identifies at critical points the biological, chemical, or physical hazards that may contribute to foodborne illnesses and outbreaks. Specific control measures are subsequently recommended to prevent, eliminate or reduce the hazards.

Refer to **Appendix E** for more detail about the HACCP principles and the procedures conducted by a food inspector during a HACCP inspection.

STEP 5. Report findings.

When the environmental outbreak investigation has been completed, the food inspector should communicate the findings with the investigation team at the local and state level.

STEP 6. Revisit establishment and conduct after action meeting.

To prevent future occurrences, the establishment should be revisited. Reports which describe the findings of the epidemiologic investigation, the laboratory analysis, and the environmental assessment should be provided to the manager. Education and prevention measures should also be discussed to ensure that the establishment serves food that is safe, unadulterated, and honestly presented.

INTENTIONAL CONTAMINATION OF FOOD

As mentioned in Section 3, intentional contamination of food should be considered if epidemiologic clues and law enforcement clues suggest that an outbreak may have been deliberately caused.

From the perspective of the environmental assessment, unusual findings observed during the inspection may provide evidence that a pathogen or chemical was deliberately added.

Environmental Clues
• Reports of unusual color, odor, or appearance of food • Evidence of tampering in food packaging • Unusual agent or vehicle • Chemicals that do not belong at the site • Sick or dead animals in the vicinity of the food preparation facility
Source: International Association for Food Protection. *Procedures to Investigate Foodborne Illness*. 5th Edition. 1999. Reprinted 2007.

In response to intentional contamination of food, food inspectors may need to conduct the following tasks:

- Collect samples of the suspected food vehicle, ingredients used to prepare the food, and environmental samples where the food was prepared or stored.
- Implement “Chain of Custody” procedures because all samples collected will be considered evidence in a criminal investigion. Refer to Section 4 for more information about “Chain of Custody”.
- Follow special procedures to handle or destroy intentionally contaminated foods.
- Depending on the causative agent identified, provide assistance with the special decontamination of the facility where the food was prepared, stored, eaten, or purchased.

A strong and flexible public health infrastructure is the best defense against any disease outbreak – naturally or intentionally caused. As with all public health events, coordination and cooperation among all agencies are critical to the success of any response.

APPENDIX A

Glossary of Terms

GLOSSARY OF TERMS AND ACRONYMS†

2x2 Table: A tabular cross-classification of data such that subcategories of one characteristic are indicated horizontally (in rows) and subcategories of another characteristic are indicated vertically (in columns). Tests of association between characteristics in the columns and rows can be readily applied. Also known as a contingency table.

	ill	not ill
Exposed	A	B
No Exposed	C	D

Asymptomatic: Showing no symptoms of illness.

Attack rate: A type of cumulative incidence rate which expresses the occurrence of a disease among a specific population at risk observed for a limited period of time, often due to a very specific exposure. Calculated by taking the total number ill and dividing by the total number of persons present during the exposure.

Bacterium: A one-celled living microorganism that can cause foodborne infections and intoxications.

Bare hand contact: Having bare hands in direct contact with prepared or ready-to-eat food items.

Biological hazard*: A bacterial, viral, or parasitic agent that may make food unsafe to eat. Often associated with microorganisms naturally found in raw meat and poultry products or microorganisms introduced during processing of meat and poultry products.

Carrier: Individuals who harbor an infectious agent but are asymptomatic. Carriers can be a source of infection for people or animals.

Case definition: A set of criteria for determining who should be classified as a case. The definition is comprised of clinical information, lab testing information, and should include information related to time, place, and person.

Case: A person with the particular item of interest or disease.

Case finding: The process of attempting to identify all possible cases; this typically uses a broad case definition and occurs early in the investigation. Cases may be identified through laboratory reports, complaints by private citizens, information received through the media, and/or by asking cases if they know of any other ill individuals. Later in the investigation, case finding might be performed to assess the extent of the outbreak.

Case-control study: An observational, analytical study in which individuals are not followed over time. Inclusion into the study is dependent upon the presence (“case”) or absence (“control”) of illness or disease. Characteristics such as previous exposures are then compared between cases and controls. For controls to be included they must have an event or exposure in common with the cases.

Chemical hazard*: Chemicals that are naturally occurring in foods (i.e., aflatoxins, mucotoxins, and shellfish toxins) or added during the processing of foods. Intentional or unintentionally added chemicals may include components of animal feed or drinking water, animal drugs, pesticides, food ingredients themselves, or chemicals used in the processing establishment, like lubricants, cleaners, paints, and coatings.

Cluster: Aggregation of relatively uncommon events or diseases in space and/or time in amounts believed or perceived to be greater than could be expected by chance.

Cohort study: An observational, analytical study involving a well-defined group of individuals who are followed over a period of time before disease develops. Inclusion into the study is dependent upon a common experience of exposure. Disease, death or other health-related outcomes are then ascertained and compared.

Common-source outbreak: An outbreak that results from a group of persons being exposed to an infectious agent or toxin from a single source.

Confidence intervals: An estimated range of values within which the true relative risk (RR) or odds ratio (OR) is likely to fall 95% of the time.

Confidentiality: The obligation to not disclose identifying information unless needed to protect the public's health.

Confirmed case: A case with a laboratory-identified etiology or meets confirmed criteria.

Confirmed disease outbreak: A foodborne disease outbreak in which laboratory analysis of appropriate specimens confirms a causative agent and epidemiologic analysis implicates the food as the source of the illness. [NOTE: Positive laboratory identification of the disease-causing organism is not necessary to determine that a foodborne disease outbreak has occurred nor is this identification needed to begin investigation.]

Consumer: A person who is a member of the public and takes possession of food. A consumer is not functioning in the capacity of an operator of a food establishment or food processing plant, and does not offer the food for resale.

Continual-source outbreak: A type of outbreak that occurs when a source remains contaminated with disease causing organism or substance and exposure and illness continues.

Controls: In a case-control study, persons without illness or disease. Controls must have the same risk/likelihood of exposure as the cases. Selection of appropriate controls is crucial to the validity of epidemiologic studies.

Control measure‡: Any action or activity that can be used to prevent, eliminate, or reduce a significant hazard.

Control point‡: Any step at which biological, chemical, or physical factors can be controlled.

Corrective action‡: Procedures that are initiated when a deviation or problem in the flow of food preparation is identified.

Critical limit‡: The maximum and/or minimum value at which a biological, chemical, or physical hazard must be controlled at a given critical control point to ensure food safety.

Critical control point (CCP)‡: A step at which control can be applied to prevent or eliminate a food safety hazard or reduce it to an acceptable level.

Cross-contamination: The transfer of pathogens from one food item to another food item during food preparation through cooking equipment, utensils, and the hands of food handlers. Usually, but not always, this transfer occurs between raw product and cooked product.

Descriptive Epidemiology: Evaluates and catalogs all the circumstances surrounding a person affected by a health event of interest. Descriptive epidemiology evaluates frequency and pattern of a health event by examining the person, place, and time in relationship to health events.

> In *person*, descriptive epidemiology examines factors like age, education, socioeconomic status, availability of health services, race, and gender.
>
> *Place* can have different meanings depending upon individual descriptive epidemiology studies. It might mean the geographic borders of a town, or the geographic features of an area. Evaluation of place might also include where people work, the population numbers of a place (density), and the environments in which people live, work, eat or attend school.
>
> *Time* might refer to the time of year, or things that happen at a specific time each day or each hour.
>
> Several tools can be utilized to help organize and depict the outbreak including linelists, epidemic curves, maps, and frequency tables.

Deviation‡: Failure to meet a critical limit.

Epidemic: The occurrence of more cases of disease than expected in a given area or among a specific group of people during a particular period of time.

Epidemic curve (epi curve): A histogram or graph that provides a visual depiction of the outbreak over time. Epi curves help characterize an outbreak and give clues about the source of the outbreak (e.g., point source vs on-going outbreaks). Epi curves are created by plotting date of onset (or incubation time for short incubations) versus the number of cases ill.

Epidemiology: The study of the distribution and determinants of health-related states or events within a specific population, and the application of this study to control health problems.

FAT TOM: (**F**ood, **A**cidity, **T**ime, **T**emperature, **O**xygen, and **M**oisture) A mnemonic device used in the food industry to describe conditions that favor the growth of foodborne microorganisms within the environmental setting.

Fecal-oral route: The ingestion of stool from an infected person or animal through food, liquids or direct contact. This is the primary mode of transmission of gastrointestinal pathogens.

Food establishment: An operation that stores, prepares, packages, serves, vends, or otherwise provides food for human consumption. Food establishments include a restaurant; satellite or catered feeding location; catering operation if the operation provides food directly to a consumer or to a conveyance used to transport people; market; vending location; conveyance used to transport people; institution; or food bank.

Food handler: A person who directly handles or prepares food.

Food processing plant: A commercial operation that manufactures, packages, labels, or stores food for human consumption and does not provide food directly to a consumer.

Food establishment complaint: A complaint related to food such as the sale of spoiled or adulterated food or unsanitary conditions at a restaurant. It is important to track consumer complaints and review the data periodically for clusters of illness or changes in trends of illness.

Food related complaint: A report by persons of symptoms which they believe are related to a food source, but which does not fit the definition of a foodborne disease outbreak (FBDO). Food related complaints can either occur over more than 48hrs, involve only one person, involve only people from one household, or are characterized only by subjective symptoms (such as nausea, headache, or dizziness).

Foodborne disease outbreak (FBDO): (1) Two or more individuals (from different households) who experience a similar illness after eating a common food or different food from a common place or (2) an unexplained, unexpected increase of a similar illness, and food is a likely source.

Foodborne illness: A disease acquired through eating or drinking contaminated food or liquids.

Foodborne infection: A disease caused by consuming food or liquids contaminated with bacteria, viruses, or parasites.

Foodborne intoxication: A disease caused by consuming food or liquids contaminated with toxins.

Gastroenteritis: Inflammation of the stomach and intestines.

HACCP‡: Hazard Analysis Critical Control Point. A science-based, systematic approach of identifying, evaluating, and controlling food safety hazards.

HACCP plan‡: A written documentation of food processing and handling procedures that is based upon the HACCP principles.

HACCP system‡: A HACCP plan in operation. The implementation of a HACCP plan.

Hazard: A biological, chemical, or physical agent that may cause foodborne illness.

High risk group/Highly susceptible population: A group of persons who are more likely than other populations to experience foodborne disease because they are immunocompromised or older adults in a facility that provides health care or assisted living services, such as a hospital

or nursing home; or preschool age children in a facility that provides custodial care, such as a day care center.

Host: A person or other living organism that can be infected by an infectious agent under natural conditions.

Host factors: An intrinsic factor (e.g., age, sex, race, behaviors) which influences an individual's exposure, susceptibility, or response to a causative agent.

Hypothesis: An educated guess based on observations.

Incidence rate: The measure of frequency of new cases of a particular disease in a population during a specified period of time.

Incubation period: The interval from the time an individual is infected to the time when symptoms first appear.

Index case: The first case among a number of similar cases that are epidemiologically related.

Jaundice: Yellowing of the skin and eyes as a result of accumulation of bile pigment in the blood.

Line listing: A table that summarizes information about persons associated with an outbreak. Information often includes identifying information, demographics, clinical information, and exposure or risk factor information.

Morbidity: Any departure from a state of physiological or psychological well-being.

Notifiable disease: A disease that is required by law to be reported to the public health authority. See Appendix C for the list of notifiable diseases in Arizona.

Odds ratio (OR): This measure of association is used to determine whether a specific exposure is associated with a certain disease. Calculated by means of a 2x2 table and requires data from cases and controls.

Onset: The date and time when clinical signs or symptoms first appear.

Outbreak: An unexpected, unexplained increase of disease occurring within a specific population at a given time and place.

Parasite: A single or multi-celled organism that can cause foodborne or other infections.

Pathogen: A disease-causing organism.

Person-to-person outbreak: See propagated-source outbreak.

Physical hazard*: A foreign material, such as glass, metal, or plastic that may cause illness or injury.

Point-source outbreak: See common-source outbreak.

Potentially Hazardous Food (PHF): Any food or food ingredient (natural or synthetic) that is capable of supporting rapid growth of microorganisms under certain conditions such as temperature. Examples include cooked or raw animal products, heat treated vegetables and starches, sprouts, and melons.

Prevalence: The number or proportion of cases or events or conditions in a given population.

Prevalence rate: The measure of frequency of all current cases of a particular disease, regardless of the time of onset, within a particular population either at a specified instant or during a specified time period.

Probable case: A case without laboratory confirmation that has typical clinical features of the particular disease under investigation including but not limited to location in time or place with confirmed cases.

Propagated-source outbreak: A type of outbreak that occurs when infections is spread from one person to another via the fecal-oral route. Index cases may have been infected by ingesting contaminated food or water but are then able to pass the organism on to others.

Public health surveillance: The ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding health-related events for use in public health action to reduce morbidity and mortality and to improve health. Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation, and/or formulating research hypotheses.

> **Sources of information for surveillance:** 1) laboratory reports; 2) morbidity and mortality reports (CDR); 3) outbreak reports; 4) absentee reports; 5) MD office or hospital visits; 6) schools; 7) population surveys; etc.
>
> **Passive surveillance:** Medical care providers/laboratories are required by law/statute to report notifiable diseases to the local or state agency. Advantages of passive surveillance: simple and minimally burdensome to health care providers. Disadvantages of passive surveillance: wait times for cases to be reported; volunteer reporting.
>
> **Active surveillance:** Actively search for cases (i.e. call MD offices, hospitals to get specific disease information). Advantages of active surveillance: provides more timely data with less variablility than passive surveillance. Disadvantages of active surveillance: more labor intensive for health care providers and public health agencies.

Pulsed-field gel electrophoresis (PFGE): A laboratory method used to separate bacterial isolates into genetic fragments, thus forming a unique “DNA fingerprint”. This method generates visually observable patterns which can be digitized and then compared with other pathogens of the same genus and species.

PulseNet: The National Molecular Subtyping Network for Foodborne Disease Surveillance; a network of laboratories throughout the U.S. that perform testing on foodborne pathogens using standard PFGE methods and compare results via images on a computer network.

***p*-value:** The probability that a difference observed could have occurred by chance alone.

Questionnaire: A predetermined set of questions used to collect data. The main components include identifying information, demographics, clinical information, exposure or risk factor information, and knowledge of illness in others.

Ready-to-eat food: A food item that can be consumed without further preparation. Examples include raw vegetables and fruits, deli meats, bread, and ice.

Recovery period: The period when symptoms decline and illness improves.

Recreational water: Waters used for swimming, whirlpools, hot tubs, spas and water parks; it may also include naturally occurring fresh and marine surface waters.

Relative risk or relative risk ratio (RR): The ratio of the attack rate for ill persons who were exposed and the attack rate for ill persons who were not exposed. Calculated using data from cohort studies.

Reservoir: The habitat or organism in which an infectious agent normally lives, grows and mulitplies.

Retail food store: Any establishment or section of an establishment where food and food products are offered to the consumer and intended for off-premises consumption, including delicatessens that offer prepared food in bulk quantities only.

Risk factor: An attribute or exposure that is associated with an increased occurrence of disease or other health-related event or condition.

Serotype: Subdivision of a species or subspecies distinguishable from other strains therein on the basis of antigenic character (i.e., *Salmonella* enterica, serotype: Typhiumurium, Oranienburg, Newport, etc.)

Spot map: A pictorial of the spatial distribution of illness within a specific setting or area.

Stool: Feces.

Surveillance: see public health surveillance

Susceptible: A person lacking sufficient resistance to a particular disease agent to prevent illness if or when exposed.

Toxin: A poison produced or released by certain bacteria that can cause foodborne intoxications.

Traceback: The method of tracing implicated food items backwards through the production and distribution chain to identify the contaminated item and remove it from the food market.

Vehicle: An inanimate intermediary in the indirect transmission of an agent that carries the agent from a reservoir to a susceptible host.

Verification‡: Those activities, other than monitoring, that determine the validity of the HACCP plan and that the system is operating according to the plan.

Virulence: The degree of pathogenicity of an infectious agent.

Virus: A minute organism that can cause foodborne infections.

Waterborne outbreak (WBO): Two criteria required (1) two or more people experience a similar illness after the ingestion of drinking water or after exposure to water used for recreational purposes, and (2) epidemiologic evidence must implicate water as the probable source of the illness. (The requirement for "two or more" is waived for single cases of laboratory-confirmed primary amebic meningoencephalitis and for single cases of chemical poisoning if the water-quality data indicate contamination by the chemical.)

> *Note*: Outbreaks caused by contamination of water or ice at the point of use (e.g., contaminated water containers) should be reported as FBDOs

Zoonosis: An infection or an infectious disease transmissible under natural conditions between animals and man.

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† Many definitions were taken from (1) Last, JM ed. *A Dictionary of Epidemiology*, 3rd ed. New York: Oxford U. Press, 1995 and (2) Chin, J ed. *Control of Communicable Diseases Manual*, 17th ed. Washington DC: American Public Health Association, 2000.

* USDA – FSIS. *Guidebook for the Preparation of HACCP Plans.* September 1999.
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‡ FDA. *HACCP: A State-of-the-Art Approach to Food Safety*.
http://www.cfsan.fda.gov/~lrd/bghaccp.html.

APPENDIX B

RESOURCES and WEB SITES

The following resources are recommended for further reading and for guidance in investigating outbreaks or other sporadic cases of infectious diseases.

FOODBONRE DISEASES AND OUTBREAKS

1. CDC. *Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians and Other Health Care Professionals*. MMWR 2004;53 (No.RR-4):1-33.

2. CDC. *Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians*. MMWR 2001;50 (No RR-2):1-69.

3. CIFOR (Council to Improve Foodborne Outbreak Response). *Guidelines for Foodborne Disease Outbreak Response*. 2009. http://www.cifor.us/projgl.cfm

4. Cliver, DO and Riemann, HP, eds*. Foodborne Diseases, 2nd Ed*. Elsevier Science LTD. 2002.

5. FDA. *Foodborne Pathogenic Microorganisms and Natural Toxins Handbook* ("The Bad Bug Book"). April 2009. http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/default.htm

6. Fiore, A.E. *Hepatitis A Transmitted by Food*. Clinical Infectious Diseases, 2004;38: 705-15.

7. Gordis, L. *Epidemiology*. Philadelphia, PA: Saunders, 2000.

8. Gregg, MB, ed. *Field Epidemiology*. New York, NY: Oxford University Press, 2002.

9. Heymann DL, ed. *Control of Communicable Diseases Manual*. 18th ed. Washington, DC: American Public Health Association, 2004.

10. Potter M, Tauxe R (1997). *Epidemiology of foodborne diseases: tools and applications*. World Health Statistics Quarterly, 50:24–29.

11. Simjee, S. ed. *Foodborne Diseases*. Totowa, NJ: Humana Press, 2007.

12. WHO. Foodborne *Disease Outbreaks: Guidelines for Investigation and Control*. Geneva, Switzerland, 2008.

WEB SITES:

1. **Arizona Department of Health Services – Office of Infectious Disease Services**
   (Programs, disease information and resource materials)
   http://www.azdhs.gov/phs/oids/index.htm

2. **Centers for Disease Control and Prevention (CDC)**
   (Health and travelers health information, immunizations, health news releases, publications, training opportunities)
   http://www.cdc.gov

3. **Emerging Infectious Diseases Homepage**
   (Current scientific articles on emerging diseases)
   http://www.cdc.gov/ncidod/EID/eid.htm

4. **Fight Bac**
   (Consumer information site of food safety and food handling issues)
   http://www.fightbac/org

5. **"The Scrub Club"**
   (FDA consumer information site for kids on proper handwashing)
   http://www.scrubclub.org

6. **National Food Safety Database**
   (Consumer information related to food safety)
   http://www.foodsafety.org

7. **U.S. Department of Agriculture (USDA)**
   (Current topics related to food issues)
   http://www.usda.gov/agency/fsis

8. **U.S. Environmental Protection Agency (EPA) – Microbiology Homepage**
   (Water-related issues, waterborne disease, regulations)
   http://www.epa.gov/microbes

9. **U.S. Environmental Protection Agency (EPA) – Office of Ground Water and Drinking Water**
   (Consumer site for current ground water and drinking water information, publications and regulations)
   http://www.epa.gov/OGWDW

10. **U.S. Food and Drug Administration (FDA) – FDA News and Publications**
    (Press releases, publications and issues related to current food issues)
    http://www.fda.gov/opacom/hpnews.html

11. **World Health Organization (WHO)**
    (Current health issues, press releases, fact sheets and general information on international health)

APPENDIX C

SUPPLEMENTAL DOCUMENTS FOR EPIDEMIOLOGIC INVESTIGATIONS

FOODBORNE OUTBREAK INVESTIGATION FLOWCHART

Has an outbreak occurred?
Two or more individuals (from separate households) who experience a similar illness after eating a common food OR different food from a common place. (This includes multiple complaints from the same facility within a 14-day time period.)

OR

Unexpected, unexplained increase of a similar illness & food is a likely source

YES

Conduct environmental assessment

Contact Supervisor and LHD/ADHS Epi

Inspect food establishment & enforce safe handling practices

Interview manager & distribute food employee surveys

Obtain menu & collect food samples for testing

Conduct HACCP inspection as directed

Report findings

Revisit establishment & conduct after action meeting

Conduct epidemiologic investigation

Contact & coordinate with key personnel

Obtain clinical specimens & food samples

Implement control & prevention measures

Define cases & conduct case finding

Describe outbreak by time, place & person

Develop possible hypotheses

Plan & conduct epidemiologic study to test hypotheses

Analyze data & interpret results

Report findings

Depending on the outbreak, steps may occur in a different order or simultaneously

LHD staff: Epi's; PHNs, CDIs, PIOs
ADHS Epi's: (602) 364-3676
Environmental Services: County and State
Arizona State Laboratory

Collect specimens & food samples; send to ASHL; Notify Epi

Initiate as soon as possible; continue throughout the outbreak investigation as needed

Develop line lists & case definition; identify additional cases

Create epi curves, spot maps, frequency tables

Make inferences from all information available

Test hypotheses; make comparisons between ill and non-ill individuals

Calculate measures of association; evaluate hypotheses using data from epidemiologic investigation, environmental assessment, and laboratory analysis

Complete and submit ADHS Outbreak Form; complete CDC NORS form; write final report; distribute report

General Foodborne Disease Outbreak Checklist

The following checklist provides general steps that those working on a foodborne disease outbreak should take during an investigation.

- ☐ Confirm that a foodborne disease outbreak has occurred. Does it meet the definition for a foodborne disease outbreak?
  - ☐ Use an “Outbreak Intake Form” to collect preliminary information

- ☐ Contact and coordinate with ADHS Infectious Disease Epidemiology at (602) 364-3676 for all outbreaks.

- ☐ Contact environmental services/food inspector, if food service establishment is involved and the inspector has not already been notified. Get any additional information that environmental services may have.
  - ☐ Send environmental services to inspect the site (if necessary)

- ☐ Contact initial complainant and obtain additional information.

- ☐ Collect names and contact information for all individuals (even those that did not become ill) that attended the event or meal.

- ☐ Ask each ill individual if they will submit a stool specimen. Send out or deliver stool specimen kits to those willing to submit a specimen and make arrangements to pick-up the specimen.
  - ☐ Make sure stool kits are available for distribution
  - ☐ Call or email ADHS Foodborne Epidemiologist to notify that specimens have been sent to ASHL.

- ☐ Implement prevention and control measures.
  - ☐ Give special restriction or exclusion instructions to ill persons who are food handlers, are associated with day care, or involved with direct patient care.
  - ☐ Emphasize good handwashing

- ☐ Create a case definition and develop a working hypothesis of the cause and source of the outbreak.

- ☐ Conduct case finding and case interviews

- ☐ Analyze the data in terms of time, place and person. Create 2x2 tables for each food/drink item on the menu or for each possible exposure

- ☐ Continue to coordinate with ADHS, environmental services, and any other staff involved in the outbreak investigation.

- ☐ Write final report.
  - ☐ Fill out ADHS Outbreak Summary Report Form
  - ☐ Enter outbreak into NORS

Example of a General Outbreak Intake Form

This form is to be used to collect information on first receipt of an outbreak report.

1. Facility name _____
2. Facility type _____
3. Contact Person _____ Phone _____
   Job Title_____ Fax _____
4. Event type (wedding, meal, etc) if applicable _____
   _____
5. Meal or event date _____
6. Number Ill _____
7. Total at event or facility (be sure to include #s in various areas such as in assisted living section and skilled nursing section)
   _____
8. Total number of staff _____
9. Date of first onset _____
10. Incubation period _____
11. Date of last onset or ongoing _____
12. Duration _____
13. Hospitalizations (yes/no) _____
    a. If yes, how many _____
    b. Where _____
14. Deaths (yes/no) _____
    a. If yes, how many _____

Notes: _____
_____
_____

(Example courtesy of Maricopa County Department of Public Health)

Arizona Administrative Code✦ Requires Providers To:

Report Communicable Diseases

to the Local Health Department

- ☎ ✱ O Amebiasis
- ☎ Anthrax
- ☎ Aseptic meningitis: viral
- ☎ Basidiobolomycosis
- ☎ Botulism
- ☎ Brucellosis
- ☎ ✱ O Campylobacteriosis
- ☎ Chagas disease (American trypanosomiasis)
- ☎ Chancroid
- ☎ Chlamydia infection, sexually transmitted
- ☎* Cholera
- ☎ Coccidioidomycosis (valley fever)
- ☎ Colorado tick fever
- O Conjunctivitis: acute
- ☎ Creutzfeldt-Jakob disease
- ☎ ✱ O Cryptosporidiosis
- ☎ *Cyclospora* infection
- ☎ Cysticercosis
- ☎ Dengue
- O Diarrhea, nausea, or vomiting
- ☎ Diphtheria
- ☎ Ehrlichiosis and Anaplasmosis
- ☎ Emerging or exotic disease
- ☎ Encephalitis, viral or parasitic
- ☎ Enterohemorrhagic *Escherichia coli*
- ☎ Enterotoxigenic *Escherichia coli*
- ☎ ✱ O Giardiasis
- ☎ Gonorrhea
- ☎ *Haemophilus influenzae*: invasive disease
- ☎ Hansen's disease (Leprosy)
- ☎ Hantavirus infection
- ☎ Hemolytic uremic syndrome
- ☎ ✱ O Hepatitis A
- ☎ Hepatitis B and D
- ☎ Hepatitis C
- ☎ ✱ O Hepatitis E
- ☎ Herpes genitalis
- ☎ HIV infection and related disease
- ☎ Influenza-associated mortality in a child
- ☎ Kawasaki syndrome
- ☎ Legionellosis (Legionnaires' disease)
- ☎ Leptospirosis
- ☎ Listeriosis
- ☎ Lyme disease
- ☎ Lymphocytic choriomeningitis
- ☎ Malaria
- ☎ Measles (rubeola)
- ☎ Meningococcal invasive disease
- ☎ Mumps
- ☎ Pertussis (whooping cough)
- ☎ Plague
- ☎ Poliomyelitis
- ☎ Psittacosis (ornithosis)
- ☎ Q fever
- ☎ Rabies in a human
- ☎ Relapsing fever (borreliosis)
- ☎ Reye syndrome
- ☎ Rocky Mountain spotted fever
- ☎ ✱ Rubella (German measles)
- ☎ Rubella syndrome, congenital
- ☎ ✱ O Salmonellosis
- O Scabies
- ☎ Severe acute respiratory syndrome
- ☎ ✱ O Shigellosis
- ☎ Smallpox
- ☎ Streptococcal Group A: invasive disease
- ☎ Streptococcal Group B: invasive disease in infants younger than 90 days of age
- ☎ *Streptococcus pneumoniae* (pneumococcal invasive disease)
- ☎ Syphilis
- ☎ ✱ O Taeniasis
- ☎ Tetanus
- ☎ Toxic shock syndrome
- ☎ Trichinosis
- ☎ Tuberculosis, active disease
- ☎ Tuberculosis latent infection in a child 5 years of age or younger (positive screening test result)
- ☎ Tularemia
- ☎ Typhoid fever
- ☎ Typhus fever
- ☎ Unexplained death with a history of fever
- ☎ Vaccinia-related adverse event
- ☎ Vancomycin-resistant or Vancomycin-intermediate *Staphylococcus aureus*
- ☎ Vancomycin-resistant *Staphylococcus epidermidis*
- ☎ Varicella (chickenpox)
- ☎ ✱ O *Vibrio* infection
- ☎ Viral hemorrhagic fever
- ☎ West Nile virus infection
- ☎ Yellow fever
- ☎ ✱ O Yersiniosis

☎ Submit a report by telephone or through an electronic reporting system authorized by the Department within 24 hours after a case or suspect case is diagnosed, treated, or detected or an occurrence is detected.

✱ If a case or suspect case is a food handler or works in a child care establishment or a health care institution, instead of reporting within the general reporting deadline, submit a report within 24 hours after the case or suspect case is diagnosed, treated, or detected.

☎ Submit a report within one working day after a case or suspect case is diagnosed, treated, or detected.

☎ Submit a report within five working days after a case or suspect case is diagnosed, treated, or detected.

O Submit a report within 24 hours after detecting an outbreak.

✦A.A.C. R9-6-202
Effective 04/01/2008

www.azdhs.gov/phs/oids/hcp_rpt.htm

Reports should be sent to:
Arizona Department of Health Services
Infectious Disease Epidemiology
150 North 18th Avenue, Suite 140
Phoenix, AZ 85007
602-364-3676 or 602-364-3199 (fax)

ARIZONA LABORATORY REPORTING REQUIREMENTS

Isolates should be sent to:
Arizona State Laboratory
250 North 17th Avenue
Phoenix, AZ 85007

◑	Arboviruses	✉✱	*Haemophilus influenzae*, other, isolated from a normally sterile site	✉	*Plasmodium* spp.
🔔☎✱	*Bacillus anthracis*	✉	Hantavirus	✉	Respiratory syncytial virus
☎✱	*Bordetella pertussis*	✉[1]	Hepatitis A virus (anti-HAV-IgM serologies)	☎+	Rubella virus and anti-rubella-IgM serologies
◑✱	*Brucella* spp.	✉[1]	Hepatitis B virus (anti-Hepatitis B core-IgM serologies, Hepatitis B surface or envelope antigen serologies, or detection of viral nucleic acid)	◑✱	*Salmonella* spp.
◑✱	*Burkholderia mallei* and *B. pseudomallei*	✉[1]	Hepatitis C virus	☎	SARS-associated corona virus
✉	*Campylobacter* spp.	✉[1]	Hepatitis D virus	◑✱	*Shigella* spp.
✉	CD_4-T-lymphocyte count of fewer than 200 per microliter of whole blood or CD_4-T-lymphocyte percentage of total lymphocytes of less than 14%	✉[1]+	Hepatitis E virus (anti-HEV-IgM serologies)	✉	*Streptococcus* Group A, isolated from a normally sterile site
✉	*Chlamydia trachomatis*	✉	HIV (by culture, antigen, antibodies to the virus, or detection of viral nucleic acid)	✉	Streptococcus Group B, isolated from a normally sterile site in an infant younger than 90 days of age
🔔☎	*Clostridium botulinum* toxin (botulism)	✉	HIV—any test result for an infant (by culture, antigen, antibodies to the virus, or detection of viral nucleic acid)	✉✱	*Streptococcus pneumoniae* and its drug sensitivity pattern, isolated from a normally sterile site
✉	*Coccidioides* spp., by culture or serologies	✉	Influenza virus	✉	*Treponema pallidum* (syphilis)
◑	*Coxiella burnetti*	✉✱	*Legionella* spp. (culture or DFA)	✉	*Trypanosoma cruzi* (Chagas disease)
✉	*Cryptosporidium* spp.	◑✱	*Listeria* spp., isolated from a normally sterile site	◑✱	Vancomycin-resistant or Vancomycin-intermediate *Staphylococcus aureus*
◑	*Cyclospora* spp.	☎+	Measles virus and anti-measles-IgM serologies	◑✱	Vancomycin resistant *Staphylococcus epidermidis*
✉	Dengue virus	✉[2]	Methicillin-resistant *Staphylococcus aureus*, isolated from a normally sterile site	🔔☎	Variola virus (smallpox)
🔔☎	Emerging or exotic disease agent	◑+	Mumps virus and anti-mumps-IgM serologies	◑✱	*Vibrio* spp.
✉	*Entamoeba histolytica*	✉✱[3]	*Mycobacterium tuberculosis* complex and its drug sensitivity pattern	🔔☎	Viral hemorrhagic fever agent
◑	*Escherichia coli* O157:H7	✉	*Neisseria gonorrhoeae*	✉	West Nile virus
◑✱	*Escherichia coli*, *Shiga*-toxin producing	☎✱	*Neisseria meningitidis*, isolated from a normally sterile site	◑✱	*Yersinia* spp. (other than *Y. pestis*)
🔔☎✱	*Francisella tularensis*	✉	Norovirus	🔔☎✱	*Yersinia pestis* (plague)
☎✱	*Haemophilus influenzae*, type b, isolated from a normally sterile site				

🔔 Submit a report immediately after receiving one specimen for detection of the agent. Report receipt of subsequent specimens within five working days after receipt.
☎ Submit a report within 24 hours after obtaining a positive test result.
◑ Submit a report within one working day after obtaining a positive test result.
✉ Submit a report within five working days after obtaining a positive test result or a test result specified on this page.
✱ Submit an isolate of the organism for each positive culture to the Arizona State Laboratory at least once each week, as applicable.
\+ For each positive test result, submit a specimen to the Arizona State Laboratory within 24 hours after obtaining the positive test result.
1 When reporting a positive result for any of the specified tests, report the results of all other tests performed for the subject as part of the disease panel.
2 Submit a report only when an initial positive result is obtained for an individual.
3 Submit an isolate of the organism only when an initial positive result is obtained for an individual, when a change in resistance pattern is detected, or when a positive result is obtained ≥ 12 months after the initial positive result is obtained for an individual.

www.azdhs.gov/phs/oids/lab_rpt.htm

A.A.C. R9-6-204
Effective 04/01/2008

Arizona Administrative Code✦ Requires an Administrator of a School, Child Care Establishment, or Shelter To:

REPORT COMMUNICABLE DISEASES

to the Local Health Department

📠	Campylobacteriosis
O	Conjunctivitis: acute
☎	Cryptosporidiosis
O	Diarrhea, nausea, or vomiting
☎	Enterohemorrhagic *Escherichia coli*
☎	*Haemophilus influenzae*: invasive disease
☎	Hepatitis A
☎	Measles
☎	Meningococcal invasive disease
☎	Mumps
☎	Pertussis (whooping cough)
☎	Rubella (German measles)
☎	Salmonellosis
O	Scabies
☎	Shigellosis
O	Streptococcal Group A infection
📠	Varicella (chicken pox)

☎ Submit a report within 24 hours after detecting a case or suspect case
O Submit a report within 24 hours after detecting an outbreak.
📠 Submit a report within five working days after detecting a case or suspect case.

www.azdhs.gov/phs/oids/school_rpt.htm/

✦A.A.C. R9-6-203
Effective 04/01/2008

Arizona Department of Health Services

COMMUNICABLE DISEASE REPORT

Important Instructions: Please complete sections 1-3 for all reportable conditions. In addition, complete Section 4 for STDs and HIV/AIDS cases, Section 5 for hepatitis, and Section 6 for tuberculosis. Once completed, return to your county or tribal health agency. If reporting through MEDSIS, go to siren.az.gov.

County / IHS Number	State ID / MEDSIS ID	Date Recived by County

1. PATIENT INFORMATION

Patient's Name (Last) (First) Middle	Date of Birth	Race (check all that apply):	Ethnicity:	Gender:	Pregnant:
		☐White ☐Pacific Islander ☐Unknown ☐Black ☐Native American ☐Asian ☐Other	☐Hispanic ☐Non-Hispanic ☐Unknown	☐Male ☐Unknown ☐Female ☐Transgender	☐No ☐Unknown ☐Yes Due date _____

Street Address: **City:** **State:** **Zip code:** **County:** **Reservation:** **Telephone#:**

Patient's Occupation or School:	Guardian: (not necessary for STD)	Outcome:	Is the patient any of the following?
		☐Survived ☐Died Date: _____	☐Healthcare worker ☐Food worker/handler ☐School or childcare worker or attendee Facility Name & Address: _____

2. REPORTABLE CONDITION INFORMATION / LAB RESULTS

Diagnosis or Suspect Reportable Condition | Onset Date | Diagnosis Date

LAB RESULTS

Date Collected	Date Finalized	Specimen Type	Lab Test	Lab Result
		☐Blood ☐CSF ☐Urine ☐Stool ☐NP Swab ☐Sputum ☐Other _____		
		☐Blood ☐CSF ☐Urine ☐Stool ☐NP Swab ☐Sputum ☐Other _____		
		☐Blood ☐CSF ☐Urine ☐Stool ☐NP Swab ☐Sputum ☐Other _____		

3. REPORTER & PROVIDER INFORMATION

Reporting Source (Physician or other reporting source)	Facility			
Street Address	City	State	Zip code	Telephone#

Provider (if different from Reporter)	Facility			
Provider Street Address	City	State	Zip code	Telephone#

Laboratory Name, Address and Telephone#

4. SEXUALLY TRANSMITTED DISEASES (STD) AND HIV/AIDS

Diagnosis

☐ **Syphilis** (specify below)
- ☐ Primary
- ☐ Secondary
- ☐ Early Latent (<1 year)
- ☐ Late (< 1 year)
- ☐ Congenital
  - Mother's Name: _____
  - Mother's DOB: _____
- ☐ Other Syphilis _____
- ☐ Neurological symptoms: _____

☐ **Chlamydia**
- ☐ PID

☐ **Gonorrhea**
- ☐ PID

☐ **Herpes**

☐ **Chancroid**

☐ **HIV/AIDS**
Risk Factors
- ☐ IDU
- ☐ Sex with IDU
- ☐ Sex with males

Date of Last Negative HIV Test: _____

Site of Infection
☐Genitalia ☐Rectum ☐Throat ☐Other

Patient had Sexual Contact with:
☐Males only ☐Refused ☐Females only ☐Unknown ☐Both

Marital Status
☐Married ☐Single ☐Divorced ☐Widowed ☐Separated ☐Domestic partner ☐Unknown

Sex Partners:
Sex partners _____
Sex partners treated _____

Treatment

Date	Drug	Dosage
Date	Drug	Dosage
Date	Drug	Dosage

5. HEPATITIS PANEL

Hepatitis A Serology Results

Hepatitis A Antibody (acute IgM anti-HAV	☐Pos ☐Neg ☐Unk

Hepatitis B Serology Results

Hepatitis B surface Antigen (HBsAg)	☐Pos ☐Neg ☐Unk
Hepatitis B core Antibody IgM (HBcAb-IgM)	☐Pos ☐Neg ☐Unk
Hepatitis B core Antibody Total (HBcAb)	☐Pos ☐Neg ☐Unk
Hepatitis B surface Antibody (HBsAb)	☐Pos ☐Neg ☐Unk
Hepatitis B e Antigen (HBeAg)	☐Pos ☐Neg ☐Unk
Symptoms consistent with acute hepatitis	☐Yes ☐No ☐Unk
Jaundice	☐Yes ☐No ☐Unk
Liver Function Test ALT: _____	AST: _____

Hepatitis C Serology Results

Hepatitis C-EIA	☐Pos ☐Neg ☐Unk	s/co ratio: _____
Hepatitis C-RIBA	☐Pos ☐Neg ☐Unk	
Hepatitis C-NAT/PCR	☐Pos ☐Neg ☐Unk	
Hepatitis C-Viral Load	_____	
Liver Function Test	ALT: _____	AST: _____

6. TUBERCULOSIS (TB)

Site of Disease
☐Pulmonary
☐Laryngeal
☐Extrapulmonary

☐ TB Infection in a Child 5 and Under (Positive TB skin test result)

Medicine and Dosage

Version: 06-2009

This form is located online at: http://www.azdhs.gov/phs/oids/epi/pdf/cdr_form.pdf

Comments:

Creating a Line Listing

A line-listing is a grid containing information about persons who are under study. Each row shows data on a single case. Each column represents a variable such as identifying information, clinical data, and epidemiologic information, such as risk and exposure factors. Line listings can be created by hand or on a computer using Microsoft® Office Excel® or Microsoft® Office Access®. The advantage of using an electronic line listing is that frequency distributions and epidemic curves can be generated rapidly. The information that goes into a line listing is generally collected on a questionnaire. The important elements from the questionnaire are then used to create a line listing.

To set up a line listing, create a table in which each row represents a case and each column represents a variable of interest.

Typical variables include:

- Personal information
  - Name, address, phone number, city and county of residence
- Demographic information
  - Age or date of birth, gender, race and occupation
- Illness information
  - Date and time of onset, date and time of recovery, date of specimen collection, results of laboratory tests
  - Symptoms including diarrhea, bloody stools, vomiting, abdominal cramps, nausea, fever, and other symptoms
- Exposure information
  - Meal location, date and time of meal, foods eaten, drinks
- Comments/Notes

It is helpful to have a comment variable on your line listing so that important information that might not be captured in any of the variables can be included. This is not an exhaustive list of variables that can be included on a line listing. The number and type of variables will change depending on the type of outbreak and the specific needs of the investigation.

After the line listing is created, cases can be added and updated during the course of the investigation.

Example line listing:

ID	Name	Age	Sex	Ill?	Onset Date	Onset Time	D	N	V	F	Office Brunch	Sample?	Results?	Comments
1	S.A.	45	F	Yes	10/19/08	1:00a	Y	Y	Y	N	Y	Y	Pending	
2	S.I.	57	F	Yes	10/18/08	11:00p	Y	Y	N	N	Y	Y	S Newport	
3	C.W.	39	M	Yes	10/18/08	11:45p	Y	N	N	N	Y	Y	Pending	drank iced tea
4	J.M.	32	M	No							Y	N		
5	J.W.	27	F	No							Y	Y	Pending	
6	C.O.	25	F	No							N			
7	C.T.	16	F	Yes	10/19/08	6:00a	N	Y	N	Y	Y	N		

Creating an Epidemic Curve[1]

Epidemic (Epi) curves can be easily made by hand or with a software package such as Microsoft® Office Excel® or Microsoft® Office PowerPoint®. The structure of an epi curve is straight forward. Simply plot the number of cases reported during an outbreak on the y-axis and the onset date and/or time on the x-axis. One of the more difficult aspects of creating an epi curve is choosing the unit of time for the x-axis. The choice is usually based on the incubation period and the time interval of the outbreak. In general, a time unit that is ¼ of the incubation period is usually appropriate. For example, the mean incubation period for Shigellosis is 48 hours, so the unit of time for the x-axis would be 12 hours. If the incubation period for the outbreak is unknown, several time intervals for the x-axis can be plotted to see which one best represents the data. Because epi curves are histograms, there should be *no* spaces between the bars. The onset date and time that is shown on the x-axis should be prior to the start of the outbreak.

If Excel is used, the easiest way to set up the data is shown in Table 1. Then follow the following steps.

Table 1 An Outbreak of Shigellosis

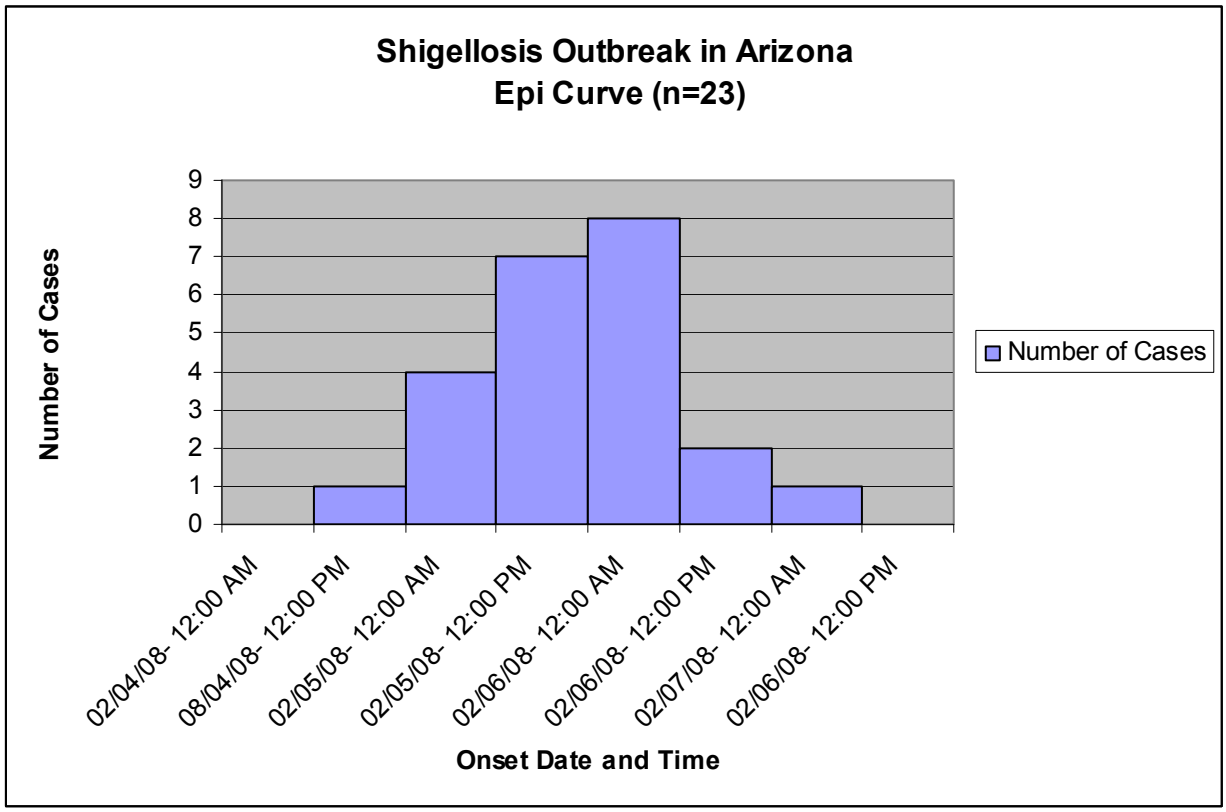
Onset Date and Time	Number of Cases
02/04/08- 12:00 AM	0
08/04/08- 12:00 PM	1
02/05/08- 12:00 AM	4
02/05/08- 12:00 PM	7
02/06/08- 12:00 AM	8
02/06/08- 12:00 PM	2
02/07/08- 12:00 AM	1
02/06/08- 12:00 PM	0

1. Click the “Chart Wizard” on the tool bar.
2. Choose “Column” as the chart type.
3. Click next and beside the “Data Range” click the red arrow and select the two columns labeled Onset Date and Time and Number of Cases. Press enter
4. Make sure that beside “Series in” that “Columns” is marked.
5. Select next.
6. Under “Chart Title” include a descriptive title for the epi curve.
7. Label the x-axis and the y-axis.
8. Select next and then select finish.
9. At this point the bars on the graph won’t be touching as they should, so double click on one of the bars.
10. Under “Format Data Series” choose the “Options” tab and set the “Gap width” to 0.
11. If the y-axis scale is set to a number that is less than 1 (example: 0.5), double click on a number on the y-axis and under “Format Axis” select the “Scale” tab.
12. Beside the “Major unit” enter in 1 unless it is a large outbreak and then enter in an appropriate number. Example of an epi curve is shown in Figure 1.

[1] Adapted from Torok, M., Focus on Field Epidemiology, Volume, 1 Issue 5

Epidemic Curve Continued:

Figure 1



Data Analyses

ANALYZING THE DATA COLLECTED:

Data should be organized and collected from the interviews of ill and well persons who ate the suspect meal or food item, who attended a common event, or who were part of a family or group of which persons became ill. Data should be used to:

- Classify the illness
- Identify affected groups
- Test the hypothesis as to whether the outbreak was associated with a common source
- Determine a vehicle
- Measure disease association
- Calculate confidence interval and statistical significance
- Determine the necessity for further field or laboratory investigations

The following are some general steps in an analysis plan:

1. Generate hypotheses
2. Determine data needed to evaluate hypotheses
3. Design questionnaire and data collection forms to get needed data
4. Collect data
5. "Manage" data: enter and edit
6. Descriptive statistics/epidemiology: numbers, frequency distributions, percentages, rates
7. Simple cross-tabulation with appropriate measures of association, tests of significance and confidence intervals
8. Stratified analysis; evaluate for confounding and effect modification
9. Multivariate analysis as needed
10. Refine analysis as needed
11. Interpret appropriately; evaluate for causal relationship

The following should be calculated to understand the data collected: frequencies and percentages, the incubation period and recovery periods, the measures of association between exposure and disease, and appropriate tests of statistical significance.

Calculating Frequencies:

COUNTS and **PERCENTAGES** should be calculated to define the outbreak:
The following is a list of common calculations:

- For all individuals (retrospective cohort or case-control study)
    - Number and percentage of persons by sex
    - Median age and age range
    - Number and percentage of ill and not ill, for retrospective cohort studies
    - Number and percentage of cases and controls for case-control studies
    - Other characteristics may be recommended depending upon the outbreak, including race/ethnicity, occupation, county, state, zip code, school name, school grade, nursing home name, room number

- Total number of persons exposed (cohort study)

- For ill persons or cases (cohort or case-control study)
    - Number and percentage of each symptom experienced
        - Diarrhea (3 or more loose stools in a 24-hour period), bloody diarrhea, vomiting, nausea, abdominal cramping, fever, malaise, headache are common symptoms
    - Number of samples collected and submitted for testing
        - Stool, blood, urine
    - Number and percentage of laboratory-confirmed results
    - Number and percentage of persons hospitalized
    - Number and percentage of medical visits

How to Calculate the MEDIAN:
The median is the midpoint of a series of ordered values. It divides a set of values into two equal parts. To identify the median from individual data:

- Arrange the observations in increasing or decreasing order
- Find the middle rank using the following formula: middle rank = (*n*+1)/2
    - If the number of values is odd, the middle rank falls on one observation
    - If the number of values is even, the middle rank falls between two observations
- Identify the value of the median
    - If the middle rank falls on a specific observation, the median is equal to the value of the middle rank
    - If the middle rank falls between two observations, the median is equal to the average of the values of those observations

Example 1
To calculate the median for the following observations: 1, 20, 5, 3 and 9:
- Arrange the observations (n = 5) by order of magnitude: 1, 3, 5, 9, 20
- Identify the middle rank: (5 + 1)/2 = 3
- The median is the third observation of the ordered series, namely 5

Example 2
To calculate the median for the following observations: 1, 20, 5, 3, 9, 21
- Arrange the observations (n = 6) by order of magnitude: 1, 3, 5, 9, 20, 21
- Identify the middle rank: (6 + 1)/2 = 3.5
- The median is the average of the value of the third and fourth observations, namely 5 and 9. Thus the median value = (5 + 9)/2 = 7

Median can also be calculated by entering values (in any order) into an excel spreadsheet column and then selecting Median from the autosum more functions menu.

Calculate the **INCUBATION PERIOD** and **RECOVERY PERIOD:**

The **INCUBATION PERIOD** is the interval from the time an individual is infected (exposed) to the time when symptoms first appear. The incubation period may differ from person to person and from organism to organism.

Incubation period = onset time – time of exposure

Example:

Time of exposure = 8:00 PM on Saturday evening
Onset of symptoms = 2:00 AM on Monday morning

1. Determine how many hours there were per day
   (*Hint:* Time and days listed in military time or 24-hour increments will make calculations much easier for most analytic software)

   Saturday: 8:00 PM is equivalent to 20:00 in military time. So, 24:00 - 20:00 = 4 hours
   Sunday: All hours were of interest = 24 hours
   Monday: 2:00 AM is equivalent to 02:00 in military time = 2 hours

2. Add all the hours together for the days of interest.

   4 + 24 + 2 = 30 hours

   30 hours/24 hours = 1.25 days

   Incubation period for ill persons = 30 hours or 1.3 days

3. Calculate the incubation period for each ill person. Determine the **median** incubation period and the **range** (the minimum and maximum numbers).

Person	Incubation Period
#1	14 hours ---------- Minimum
#2	18 hours
#3	23 hours
#4	30 hours ---------- Median
#5	36 hours
#6	45 hours
#7	47 hours ---------- Maximum

The **RECOVERY PERIOD** is the period when symptoms decline and illness improves

Recovery period = recovery time – onset time

Example:

Onset of symptoms = 2:00 AM on Monday morning
Recovery from illness = 11:00 PM on Tuesday evening

1. Determine how many hours there were per day

(*Hint:* Time and days listed in military time or 24-hour increments will make calculations much easier for most analytic software)

Monday: 2:00 AM is equivalent to 02:00 in military time. So, 24:00 - 2:00 = 22 hours
Tuesday: 11:00 PM is equivalent to 23:00 in military time. So the hours of interest on Tuesday = 23 hours

2. Add all the hours together for the days of interest
   22 + 23 = 45 hours

   45 hours/ 24 hours = 1.88 days

   Recovery period for ill person = 45 hours or 1.9 days

3. Calculate the recovery period for each ill person. Determine the **median** recovery period and the **range**.

Person	Incubation Period
#1	28 hours ---------- Minimum
#2	29 hours
#3	33 hours
#4	37 hours ---------- Median
#5	40 hours
#6	45 hours
#7	51 hours ---------- Maximum

Calculate **MEASURES OF ASSOCIATION:**

A measure of association quantifies the strength or magnitude of the statistical association between the exposure and the health problem of interest. Measures of association are sometimes called measures of effect because – if the exposure is causally related to the disease – the measures quantify the effect of having the exposure on the incidence of disease.

In **COHORT** studies, the measure of association most commonly used is the **RELATIVE RISK**

In **CASE-CONTROL** studies, the **ODDS RATIO** is the most commonly used measure of association.

Utilize a 2 x 2 table to calculate measures of association:

A 2 x 2 contingency table can be used to compare the association between illness and exposure

	Ill	Not Ill	
Exposed	**a**	**b**	**(a + b)**
Not Exposed	**c**	**d**	**(c + d)**
	(a + c)	**(b + d)**	**a + b + c + d**

Interpretation of the elements in the 2 x 2 table:

a = the number of ill persons who were exposed to a specific risk factor
b = the number of persons who did not become ill, but were exposed to a specific risk factor
c = the number of ill persons who were not exposed to a specific risk factor
d = the number of persons who did not become ill and were not exposed to a specific risk factor

(a + b) = the total number of persons exposed
(c + d) = the total number of persons not exposed
(a + c) = The total number of ill persons
(b + d) = the total number of not-ill persons

a + b + c + d = the total number of persons

Statistical programs are available to assist in the calculation of these measures, including SAS, SPSS, EpiInfo and online programs such as *OpenEpi* and *MedCalc*.

CALCULATIONS FOR RETROSPECTIVE COHORT STUDIES:

Using a 2 x 2 table, attack rates, food-specific attack rates, and relative risk ratios may be calculated to describe the association between illness and exposure for retrospective cohort studies.

ATTACK RATES (includes food-specific attack rates):

An **attack rate** represents the occurrence of disease observed among a defined population over a limited period of time. Specifically, it is used to calculate (1) the percentage of illness among all individuals who were exposed to a specific risk factor and (2) the percentage of illness among all individuals who were not exposed to the specific risk factor.

$$\textbf{Attack rate for ill persons who were exposed} = \frac{a}{a+b} \times 100$$

$$\textbf{Attack rate for ill persons who were not exposed} = \frac{c}{c+d} \times 100$$

RELATIVE RISK:

A relative risk (RR) is the measure of association between exposure and illness used for cohort studies. The relative risk reflects the excess risk in the exposed group compared with the unexposed (background, expected) group.

In acute outbreak settings, risk is represented by the attack rate and thus the RR is the ratio of the attack rate for ill persons who were exposed and the attack rate for ill persons who were not exposed.

$$\textbf{Relative risk ratio} = \frac{\textbf{Attack rate for ill persons who were exposed}}{\textbf{Attack rate for ill persons who were not exposed}} = \frac{a/a+b}{c/c+d}$$

How to interpret the Relative Risk:

RR = 1: The risk of illness among exposed persons is the same as the risk of illness among those not exposed

RR > 1: Risk of illness is greater in the exposed group than in the unexposed group

RR < 1: Risk of illness in the exposed group is less than the risk in the unexposed group

Example 1: One hundred fifty individuals attended a wedding reception. Several persons became ill with diarrhea and vomiting between 12 and 48 hours after eating food served at the reception. Calculate the attack rate for (1) ill persons who ate the food served at the reception and (2) ill persons who did not eat the food served at the reception. Also calculate the relative risk (RR) ratio and interpret the results.

	Ill	Not Ill	
Ate food at reception	**72**	**63**	**135**
Did not eat food at reception	**2**	**13**	**15**
	74	**76**	**150**

$$\textbf{Attack rate for ill persons who ate food} = \frac{72}{135} \times 100 = 53.3\%$$

$$\textbf{Attack rate for ill persons who did not eat food} = \frac{2}{15} \times 100 = 13.3\%$$

$$\textbf{RR} = \frac{\textbf{AR for ill persons who ate at reception}}{\textbf{AR for ill persons who did not eat at reception}} = \frac{72/135}{2/15} = \frac{.533}{.133} = 4.0$$

Interpretation: About 53% of the persons who became ill had eaten the food served at the reception compared to 13% who became ill and had not eaten the food. The risk of illness among persons who ate food at the reception appears to be 4 time higher than the risk of illness among persons who did not eat food at the reception. In other words, persons who ate food at the reception were four times more likely to experience illness compared to persons who did not eat food at the reception.

Example 2: One hundred thirty-five individuals attended the wedding reception and ate the food served. Specific foods served included salad, dinner rolls, chicken, and cake. Calculate the food-specific attack rates for (1) ill persons who ate each of these items and (2) ill persons who did not eat each of these items. Also calculate the respective relative risk (RR) ratios and interpret the results.

EATING SALAD *vs*. BECOMING ILL

	Ill	**Not Ill**	
Ate salad	**62**	**53**	**115**
Did not eat salad	**10**	**10**	**20**
	72	**63**	**135**

$$\textbf{Attack rate for ill persons who ate salad} = \frac{62}{115} \times 100 = 53.9\%$$

$$\textbf{Attack rate for ill persons who did not eat salad} = \frac{10}{20} \times 100 = 50.0\%$$

$$\textbf{RR} = \frac{\text{AR for ill persons who ate salad}}{\text{AR for ill persons who did not eat salad}} = \frac{62/115}{10/20} = \frac{.539}{.50} = 1.1$$

Interpretation: About 54% of the persons who became ill had eaten the salad served at the reception compared to 50% who became ill and had not eaten the salad. The risk of illness among persons who ate salad served at the reception was almost the same as the risk of illness among persons who did not eat the salad. In other words, persons who ate salad served at the reception were as likely to experience illness as persons who did not eat the salad.

EATING DINNER ROLLS vs. BECOMING ILL

	Ill	Not Ill	
Ate dinner rolls	57	40	97
Did not eat dinner rolls	15	23	38
	72	63	135

$$\text{AR for ill persons who ate dinner roll} = \frac{57}{97} \times 100 = 58.8\%$$

$$\text{AR for ill persons who did not eat dinner roll} = \frac{15}{38} \times 100 = 39.5\%$$

$$\text{RR} = \frac{\text{AR for ill persons who ate dinner roll}}{\text{AR for ill persons who did not eat dinner roll}} = \frac{57/97}{15/38} = \frac{.588}{.395} = 1.49$$

Interpretation: About 59% of the persons who became ill had eaten the dinner rolls served at the reception compared to 40% who became ill and had not eaten the dinner rolls. The risk of illness among persons who ate the dinner rolls served at the reception was 1.5 times higher than the risk of illness among persons who did not eat the dinner rolls. In other words, persons who ate the dinner rolls served at the reception were 1.5 times more likely to experience illness compared to persons who did not eat the dinner rolls.

EATING CHICKEN vs. BECOMING ILL

	Ill	Not Ill	
Ate chicken	66	57	123
Did not eat chicken	6	6	12
	72	63	135

$$\text{AR for ill persons who ate chicken} = \frac{66}{123} \times 100 = 53.7\%$$

$$\text{AR for ill persons who did not eat chicken} = \frac{6}{12} \times 100 = 50.0\%$$

$$\text{RR} = \frac{\text{AR for ill persons who ate chicken}}{\text{AR for ill persons who did not eat chicken}} = \frac{66/123}{6/12} = \frac{.537}{.500} = 1.1$$

Interpretation: About 54% of the persons who became ill had eaten the chicken served at the reception compared to 50% who became ill and had not eaten the chicken. The risk of illness among persons who ate chicken served at the reception was almost the same as the risk of illness among persons who did not eat the chicken. In other words, persons who ate chicken served at the reception were as likely to experience illness compared to those persons who did not eat the chicken.

EATING CAKE vs. BECOMING ILL

	Ill	Not Ill	
Ate cake	**66**	**28**	**94**
Did not eat cake	**6**	**35**	**41**
	72	**63**	**135**

$$\text{AR for ill persons who ate cake} = \frac{66}{94} \times 100 = 70.2\%$$

$$\text{AR for ill persons who did not eat cake} = \frac{6}{41} \times 100 = 14.6\%$$

$$\text{RR} = \frac{\text{AR for ill persons who ate cake}}{\text{AR for ill persons who did not eat cake}} = \frac{66/94}{6/41} = \frac{.702}{.146} = 4.8$$

Interpretation: About 70% of the persons who became ill had eaten the cake served at the reception compared to 15% who became ill and had not eaten the cake. The risk of illness among persons who ate cake served at the reception was almost 5 times higher than the risk of illness among persons who did not eat cake. In other words, persons who ate cake served at the reception were almost five times more likely to experience illness compared to persons who did not eat cake.

SUMMARY EXPOSURE TABLES:
If the goal of the investigation is to identify one or more vehicles or risk factors for disease, it may be helpful to summarize the exposures of interest in a single table. For a foodborne outbreak, the table typically includes each food item served, numbers of ill and well persons by food consumption history, food-specific attack rates (if a cohort study was done), relative risk (or odds ratio), confidence intervals and chi-square and/or p-value. To identify a culprit, you should look for a food item with two features:

1. An elevated relative risk, odds ratio, or chi-square (small *P* value), reflecting a substantial difference in attack rates among those exposed to the item and those not exposed.

2. Most of the ill persons had been exposed, so that the exposure could "explain" most if not all of the cases

Food-Specific Attack Rates for Persons Who Ate at Wedding Reception*

	ATE			DID NOT EAT					
Food	**# Cases**	**Total**	**AR %**	**# Cases**	**Total**	**AR %**	**RR**	**(95% CI)**	***P* Value**
Salad	62	115	55%	10	20	50%	1.1	0.67-1.76	0.75
Dinner Rolls	57	97	59%	15	38	40%	1.5	1.03-2.08	0.04
Chicken	66	123	54%	6	12	50%	1.1	0.59-1.96	0.81
Cake	66	94	70%	6	41	15%	4.8	2.26-10.17	<0.00

*AR=attack rate; RR=relative risk; and CI=confidence interval.

OVERALL INTERPRETATION: Based on the attack rates and relative risk ratios for each food item served at the reception, cake appears to be the most likely suspect food item as it has the highest relative risk (and smallest *P* value) and can account for 66 of 72 cases.

CALCULATIONS FOR CASE-CONTROL STUDIES

The 2x2 table may also be used to calculate the odds ratio for case-control studies.

The **ODDS RATIO (OR)** measures whether a specific exposure is associated with a certain disease. In other words, it is the ratio of the odds that the cases were exposed to the odds that the controls were exposed. Odds ratios related to exposure to specific food items can also be calculated.

NOTE: The relative risk ratio cannot be used to measure the association between exposure and illness for case-control studies because the total population exposed in not well-defined.

	Ill	Not Ill	
Exposed	**a**	**b**	**(a + b)**
Not Exposed	**c**	**d**	**(c + d)**
	(a + c)	**(b + d)**	**a + b + c + d**

$$\text{Odds that the cases were exposed} = \frac{a}{b}$$

$$\text{Odds that the controls were exposed} = \frac{c}{d}$$

$$OR = \frac{\text{Odds that the cases were exposed}}{\text{Odds that the controls were exposed}} = \frac{a/b}{c/d} = \frac{ad}{bc}$$

Interpretations of Odds Ratio (OR):

OR = 1: The odds of exposure among cases is the same as the odds of exposure among controls

OR > 1: Odds of exposure among cases is *higher* than the odds of exposure among controls

OR < 1: Odds of exposure among cases is *lower* than the odds of exposure among controls

Example: Five persons reported eating at Restaurant X and becoming ill. After conducting a case-control study, the following numbers were obtained. Calculate the odds ratio and interpret the results. Also calculate the odds of becoming ill from eating a beef dish served at Restaurant X.

	Case	Control	
Ate at Restaurant X	**25**	**30**	**55**
Did not eat at Restaurant X	**10**	**40**	**50**
	35	**70**	**105**

$$\textbf{OR} = \frac{\text{Odds that the cases ate at Restaurant X}}{\text{Odds that the controls ate at Restaurant X}} = \frac{25/30}{10/40} = \frac{25(40)}{30(10)} = \frac{1000}{300}$$

= 3.3

Interpretation: The odds of being exposed to Restaurant X are 3 times higher among cases than among controls. It is also reasonable to say that the odds of developing illness are 3.3 times higher among those exposed to Restaurant X than among those not exposed. Thus, it can be concluded that eating at Restaurant X may have contributed to illness.

ODDS OF BECOMING A CASE FROM EATING BEEF AT RESTAURANT X

	Case	Control	
Ate beef at Restaurant X	**30**	**13**	**43**
Did not eat beef at Restaurant X	**3**	**9**	**12**
	33	**22**	**55**

$$\textbf{OR} = \frac{\text{Odds that the cases ate beef}}{\text{Odds that the controls ate beef}} = \frac{30/13}{3/9} = \frac{30(9)}{3(13)} = \frac{270}{39}$$

= 6.9

Interpretation: The odds of being exposed to beef at Restaurant X are approximately 7 times higher among cases than among controls. From this it can be concluded that eating beef at Restaurant X may have contributed to illness.

CONFIDENCE TESTING OF THE RR AND THE OR

Tests of significance are calculated to determine if the association between exposure and illness occurred by chance alone. In other words, was the association observed between exposure and illness a random occurrence? The **95% confidence intervals** and the ***p*-values** may be calculated to determine the significance of the association between exposure and illness.

The 95% confidence intervals (C. I.) indicate how "confident" one can be that the RR or the OR observed actually lies within a range of numbers. In other words, the confidence interval is an estimated range of values within which the true RR or OR is likely to fall 95% of the time. Suppose that you conducted a study in which the relative risk for eating peanut butter and Salmonella was 4.0, and the 95% confidence interval was 3.0 to 5.3. Your single best guess of the association in the general population is 4.0, but your data are consistent with values anywhere from 3.0 to 5.3. The width of a CI (i.e., the values included) reflects the precision with which a study can pinpoint an association such as a relative risk. A wide confidence interval reflects a large amount of variability or imprecision. A narrow confidence interval reflects little variability and high precision. Usually, the larger the number of subjects or observations in a study, the greater the precision and the narrower the confidence interval. If a confidence interval includes 1.0 then the results can be interpreted to mean that risk of illness in those exposed is the same as the risk of illness in those not exposed.

In contrast, *p*-values represent the probability that the association observed between exposure and illness could have occurred by chance alone. Epidemiologists typically select the probability level (alpha) for determining the significance of the data at 0.05. If the p-value is smaller than this cutoff, the association is then said to be "statistically significant".

Many statistical programs, like EpiInfo™, SAS, SPSS and *OpenEpi* readily calculate these values. Refer to these statistical programs or statistical books for more information.

Preparing the Final Epidemiology Report

Purpose of a written report:

- To document the progression and rationale behind activities in the investigation
- To document information in case of potential legal issues
- To provide a reference for education and improve investigations and prevention methods for future outbreaks

The following is a standard format of a written report. The format may be modified depending on the complexity of the outbreak.

BACKGROUND – should include the following information**:**

- What was the setting in which the problem occurred or what were the circumstances initiating the investigation? Were any special events surrounding the outbreak?
- Who was involved in the outbreak? (Do not use names of case-patients or contacts. The names of the LHD personnel or authorized personnel involved in the investigation may be included. The names of facilities or locations where FBO/WBO's occurred are usually not included but may be included at the discretion of the LHD.)
- Demographic setting (age, gender, occupation, etc.)
- How many exposed? How many people were ill? (Those meeting the case definition)
- What was the severity and clinical picture of cases? (e.g., # ill, # hospitalized, # deaths, list of symptoms, unusual clinical cases or onset times)
- Where did it occur? Relevant geography (e.g., home environment, work environment, school environment)
- Is it an ongoing problem?

METHODS – this section should include epidemiologic, environmental, and laboratory or clinical information:

- Epidemiologic Investigation
    - What was the case definition?
    - What investigation tools were used to collect or organize the information?
        - Line list
        - Epidemic curves
        - Maps
        - Chart reviews
        - Communication with health care providers
        - Questionnaire
    - If a questionnaire was administered, how was it administered? (e.g., self administered, phone interview, in person, electronically, etc.)
        - Include a copy of the questionnaire used
    - What type of study was conducted?
    - What statistical analyses were conducted?
    - What hypotheses were generated?
    - What prevention and control measures were implemented?
    - What entities were involved?
    - What specific tasks were conducted?
- Laboratory Analysis
    - Were clinical specimens collected for testing?
    - Were food/environmental specimens collected for testing?
    - What tests were conducted?

- Environmental Assessment
  - What kind of environmental assessment was conducted?
  - What was the physical layout of the outbreak?
  - Was a HACCP investigation performed?
  - Were there any tracebacks?

RESULTS – should also include epidemiologic, environmental and laboratory or clinical information:

- What did the investigation reveal? (What was the etiologic agent? What was the vehicle? What was the primary problem? Has it been resolved?)
- Epidemiologic information
  - Total number of persons exposed (cohort study)
  - For all individuals (cohort or case-control study)
    - Number and percentage of persons by age group
    - Number and percentage of persons by sex
    - Number and percentage of persons of other demographics collected
  - Number and percentage of ill and not-ill or of cases and controls
  - For ill persons or cases (cohort or case-control study)
    - Number and percentage of each symptom experienced
    - Number of samples collected
    - Number and percentage of positive results
    - Number and percentage of hospitalized persons
    - Number and percentage of medical visits
    - Incubation period (median and range)
    - Recovery period (median and range)
    - Epidemic curves
  - Overall attack rates and food-specific attack rates (cohort study)
  - Measures of association
    - Relative risk (cohort study)
    - Odds ratio (case-control study)
    - Any additional results
- What did the sanitarian's report reveal? (Did environmental factors contribute to the outbreak?)
- Laboratory results (Clinical or environmental samples. Do they support the hypothesis?)

DISCUSSION – should make interpretations of all the information collected during the outbreak investigation:

- Taking into account all the information collected, what can be concluded about the outbreak?
- Did the results from the epidemiologic investigation, laboratory analysis, and environmental assessment support the hypothesis generated?
- Were there any important or unusual outcomes or findings?
- What were the strengths and limitations of the study conducted?
- Summarize important aspects of the investigation (What important elements were learned from this investigation that could be used by the LHD or other LHDs)

RECOMMENDATIONS – should provide educational information to aid others in outbreak investigations:

- What were the final prevention and control measures? Were they successful?

- What measures would prevent future occurrences?

SUPPORTING DOCUMENTS – should include any relevant information from the outbreak investigation. Important documentation includes the following:

- Copy of the questionnaire or survey tool used
- Tables, epidemic curves, or maps
- Inspection reports
- Disease Fact Sheets
- Any press releases

Considerations when reporting on an outbreak related to restaurants, weddings, or banquets:

Eating Establishments

- Did the eating establishment have a history of violations or food complaints?
- Did the facility maintain an accurate record of food workers missing work due to illness? Were any workers ill at the time of the outbreak? Were there any illnesses in the families of food workers?
- Did the facility have a policy regarding ill food workers? Any exclusions?
- Was the schedule of staff working at the time of, or shortly before the outbreak available?
- Did food workers wear disposable gloves?
- Were there adequate hand washing facilities available?
- Before the outbreak, did the facility change the menu or serve unusual food items? Offer any specials?
- Were invoices of suspect foods available and obtained if tracebacks were warranted?
- Were foods prepared ahead in batches or precooked (e.g., roasts)?
- Were foods held at room temperature before food preparation (e.g., pooled eggs for omelets)?
- Did facility use municipal or well water (if well, record of last well test available?)
- Were there opportunities for cross contamination of foods during food handling?
- Were there opportunities for cross contamination of foods in coolers (e.g., poultry dripping on lettuce)?
- Were there opportunities for cross contamination or back flow fro the plumbing system?

Additional comments for weddings or banquets

- Is a table arrangement available? Location of buffet lines?
- How was food prepared? (In batches? Precooked portions? Uniform cooking facilities? How long were foods held before serving? etc.)
- Was food left out on the buffet tables? How long?
- Were meals cooked in-house or catered? (If catered, see restaurant recommendations)
- Are there any leftover food items available?
- Can illnesses be linked to rehearsal dinner? (Location? Time? Foods? etc.)
- Were there any other social events in conjunction with the wedding or banquet? (e.g., happy hour, hotel parties, brunches)
- Hotel arrangements? (foods, parties, swimming pool or whirlpools, room numbers, ice machines, etc.)

Example of a final written report

Salmonella Newport outbreak associated with a fundraising event -- Yuma, Arizona *February 2008*

Prepared by

Arizona Department of Health Services
Office of Infectious Disease Services
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and

Yuma County Health Department
Yuma, AZ

Salmonella Newport outbreak associated with a fundraising event – Yuma, Arizona
February 2, 2008

Background

Approximately 2,000 to 2,500 people attended a fundraiser event held at the Yuma County Fairgrounds on 2 February 2008. The gates opened at 12:30pm and closed at 11pm. This daylong event featured calf roping, barrel racing, a chili cook-off, children's games and a live music concert. Dinner was also included in the price of admission and was served between 4:30 and 8pm. The dinner menu included barbecue beef tri-tip, ranch style beans, classic green salad with buttermilk Italian dressing, homemade salsa, homemade flour tortillas, hot dogs, soft serve ice cream, and drinks. Approximately 2,100 pounds of tri-tip were donated by a cattle company in Wellton, AZ and grilled at the event. The ranch style beans were prepared at the local prison on 2 February 2008 and delivered to the event on the same day at 2:30pm, the salad was pre-packaged from the Dole plant, and both the salsa and tortillas were prepared on-site at the event. Leftover sliced barbecue tri-tip beef was available for purchase and/or given to volunteers to take home at the end of the event. Remaining unsliced barbecue tri-tip and salsa were later donated to Shelter X on 3 February 2008.

The Arizona Department of Health Services (ADHS), Office of Infectious Disease Epidemiology and Investigations received a call on 12 February 2008 from the epidemiologist at the Yuma County Health Department (YCHD), regarding a cluster of laboratory confirmed *Salmonella* cases from Yuma County Regional Hospital (YCRH). Many of those infected reported eating at the event or at Shelter X. There were six hospitalizations and no deaths associated with this cluster. The event coordinator provided a list of 20 staff members who attended the event and a list of 25 cooks and 40 servers who volunteered at the event. The Captain from the Sheriff's Office also provided a list of 37 volunteers who provided security at the event. ADHS began the investigation on 14 February 2008.

Methods

The investigation was conducted by a team of three epidemiologists from ADHS, three epidemiologists from YCHD, and two sanitarians from YCHD. The investigation consisted of an on-site inspection, laboratory testing of specimens submitted to the Arizona State Lab (ASL), phone and person-to-person interviews, and data analysis.

A working case definition was developed for the outbreak. Any Yuma County resident experiencing diarrhea, vomiting or nausea between 01 February 2008 and 09 February 2008 was considered a case. A line list containing information on all laboratory confirmed cases was created. A specific foodborne questionnaire was developed for the outbreak, including specific food items based on menus collected by the sanitarians. Instructions were given to ADHS and YCHD epidemiologists to interview all volunteers from the Sheriff's Office (ill and non-ill), all guests, residents and staff members at the shelter (ill and non-ill), and anyone who fit the case definition (ill only). Case interviews began on 15 February 2008 and ended on 22 February 2008. Two spouses of volunteers from the Sheriff's Office were included in the interview sample. No stool samples from ill people were collected for testing. One hundred and nineteen individuals were interviewed face-to-face or by phone, with 87 (73%) reporting gastrointestinal illness.

Two registered sanitarians with the Environmental Health Division at YCHD collected the dinner menu at the fundraiser event and one week of menus at the shelter to assist with the

investigation. They contacted the event coordinator, the event cook, the beef production company, the kitchen supervisor at the Yuma County Detention Facility, and the directors at Shelter X . None of the food handlers at the event, County Jail, or Shelter X reported any illness. Food samples (tri-tip beef and salsa) from the meals prepared at the event were collected and sent to ASL for testing on 12 February 2008. Additional environmental samples were collected at a later date. Swabs from the meat slicer used at the shelter were collected on 15 February 2008, and swabs from the two meat slicers used at the event and the six coolers used to store the tri-tip at the event were collected on 04 March 2008.

After the tri-tip beef tested positive for *Salmonella* the director of YCHD issued a press release on 22 February 2008 notifying the community to dispose of any leftover tri-tip that was taken home from the event. Many individuals had purchased the tri-tip to take home and were unaware of the potential risk of illness. The exact number of individuals who purchased the tri-tip is unknown.

ADHS Office of Environmental Health staff contacted the Food Safety and Inspection Service (FSIS) and found no outstanding code violations by the beef production company

Results

All 19 laboratory confirmed cases from YCRH were positive for *Salmonella* Newport and matched on first and second enzymes (cluster JJPX01.0438). The tri-tip beef was negative for *Salmonella* Newport due to cross-contamination in the laboratory, however the meat slicer used at the shelter was positive for *Salmonella* Newport and had the same PFGE pattern as the cases. Attempts to obtain leftover tri-tip for repeat testing were made, but no tri-tip was recovered for testing. Swabs from the coolers and meat slicers used at the event were negative for *Salmonella* Newport.

Discussions with the event cook revealed that 2,100lbs of tri-tip were delivered in sealed commercial boxes to the facility in a refrigerated truck on 30 January 2008. Temperature on the truck was not recorded, but 4,000lbs of ice were also on the truck and were not observed to be melting. The meat remained on the truck and was unloaded as needed just prior to cooking. Cooking of the meat started at 2pm and ended at 7pm on 2 February 2008. The meat was unloaded from the truck, coated in a mixture of salt and pepper for about a minute, barbecued for approximately 75 minutes, sliced using commercial slicers at the slicing tables, transferred in disposable aluminum pans to six insulated coolers where they were stored for a maximum of 15-30 min, and then served. Leftover sliced barbecue tri-tip was sold to customers at the end of the event. Leftover whole barbecue tri-tip (not sliced) was stored in the coolers, transferred to the refrigerated truck where they were stored overnight, removed from the truck around 10am the next morning, transferred to two 5 gallon seed buckets, and delivered to the shelter in a non-refrigerated truck around 12pm. Temperatures of the tri-tip were not recorded at any time (i.e. before and after cooking, before and after storage). Food handlers wore gloves while slicing the meat and serving customers. Five grills with rotating teams of cooks were used to cook the meat. The commercial slicers and coolers were cleaned with hot soap and water prior to the event. Of note, the coolers were used for storing raw javalina meat prior to the event.

Discussions with the kitchen supervisor at the County Jail revealed that approximately 300lbs of dry beans were delivered in a non-refrigerated truck on 1 February 2008. The kitchen staff began cooking the beans on 2 February 2008. Cooking ended at 10am, but the beans were kept in the hot stove until 2:30pm. Beans were then transferred to kettles and delivered in

a non-refrigerated truck to the event. Exact time of delivery to the event is unknown. Temperature of the beans before transfer was 200F.

Discussions with the kitchen supervisor at Shelter X revealed that leftover salsa and whole tri-tip beef were delivered around 12pm on 3 February 2008. The meat was delivered in two 5 gallon seed buckets (12-15 chunks in each bucket) and inspected upon delivery. No temperature was recorded at time of delivery. The meat was later stored in the same seed buckets and placed in the refrigerator overnight. Preparation of the meat started around 9am on 4 February 2008. The meat was taken out of the seed buckets, sliced using a commercial slicer, transferred to six-inch pans, refrigerated until ready to cook, cooked in the oven for 90 minutes at 350F around 4pm, and placed on the steam table to be served. Food handlers wore gloves while preparing the meat. Temperatures before and after cooking were not recorded.

Of 87 ill individuals, 79 (91%) ate the tri-tip at the event, shelter or at home. The age range of ill individuals was 4 to 83 years. Analysis showed 87% ill among residents and staff members at the shelter and 32% ill among volunteers from the Sheriff's Office. Attack rates and rate ratios for each food item served at the event and shelter were calculated for each cohort. Statistical analysis of food items showed a strong association between persons who became ill and beef consumption at the shelter. See tables below.

Table 1. Food-specific attack rates in volunteers who provided security at the event from the Sheriff's Office (n= 34)

Food Item	Ill N= 11 n (%)	Well N= 23 n (%)	Attack rate (%)	Rate Ratio (95%CI)
Tri-tip beef	9 (81.8)	16 (69.6)	36	1.6 (.4-6.1)
Chilli	2 (18.2)	2 (8.7)	50	1.3 (.4-4.3)
Salad	5 (45.5)	9 (39.1)	36	1.0 (.4-2.8)
Beans	6 (54.5)	9 (39.1)	40	1.4 (.5-3.6)
Salsa	5 (45.5)	8 (34.8)	39	1.2 (.5-3.1)
Tortillas	6 (54.5)	9 (39.1)	40	1.3 (.5-3.6)
Soft-serve ice-cream	3 (27.3)	1 (4.3)	75	2.2 (.9-5.5)

Table 2. Food-specific attack rates in residents, guests, and staff members at the Crossroads Mission shelter (n= 55)

Food Item	Ill N= 48 n (%)	Well N= 7 n (%)	Attack rate (%)	Rate Ratio (95%CI)
Tri-tip beef	44 (91.7)	0	100	2.8 (1.3–6.1)
Salsa	9 (18.7)	0	100	1.2 (1.0-1.3)
Vegetables	20 (41.7)	0	100	1.3 (1.1-1.5)
Chocolate milk	6 (12.5)	0	100	1.2 (1.0-1.3)

We interviewed an additional 30 individuals who attended the event, but were not part of either cohort. These were culture confirmed *Salmonella* cases and/or friends of culture confirmed cases who experienced the same symptoms as the cases. Of these 30, 28 met the case definition and 27 reported eating beef at the event. The attack rate in individuals who ate beef was 90% (RR= 1.4, 95% CI= 0.6–3.2).

Discussion

This *Salmonella* outbreak was associated with beef consumption at the event and shelter. Overall, 87/119 individuals met the case definition and 80/87 consumed beef at the event or shelter. There were six hospitalizations and no deaths recorded as a result of this infection. Nineteen individuals who consumed beef at the event or shelter were culture confirmed for *Salmonella* Newport. Samples from the commercial meat slicer used at the shelter yielded *S.* Newport with an indistinguishable PFGE pattern from the outbreak strain. ADHS has not received any new reports of GI illnesses associated with meat consumption at the event or shelter over the past several weeks.

This outbreak has been contained and controlled because of YCHD's quick and aggressive action in limiting further spread of disease. Cooperation between ADHS and YCHD facilitated the epidemiological investigation and demonstrated a true concern for the public health of the community.

Recommendations

Contamination from improper food handling is suspected. Improved food handling practices are needed to prevent future outbreaks. ADHS recommends the following prevention and control measures:

1. Ensure the use of appropriate containers for food storage
2. Ensure the use of appropriate disinfecting agents to disinfect commercial slicers and storage containers

Reported March 24, 2008 by
ADHS/YCHD

Outbreak Name:_____
Interviewer Name: _____
Interview Date: ____/____/_____

Arizona Department of Health Services
Specific Foodborne Questionnaire - Yuma Outbreak

The purpose of this questionnaire is to further identify the source of an investigation where food was identified as a common factor through the hypothesis generating questionnaire. This questionnaire is a template and should be modified depending on the specific needs of the investigation (for example: additional questions specific to the common food establishment).

DEMOGRAPHICS *(obtain from hypothesis generating questionnaire)*
Name: _____ Gender: M F (circle one)
Date of Birth: ____/____/____ **OR** Age on your last birthday: _____
If <18years old ask parent/guardian if it would be possible to speak with their {son/daughter} directly or together with them.
Address: _____
City: _____ County: _____
Zip: _____
Home Phone: (_____) _____ - _____
Parent's Name (if child): _____
Occupation: _____
Work Phone: (_____) _____ - _____
At what phone number can we reach you in the next two weeks, if necessary?
(Please check appropriate box, if Other, fill in other phone number)
☐ Home ☐ Work ☐ Other: (_____) _____ - _____
If known:
Laboratory ID: _____
Test Results: _____

---CALL CASE---

Introduction Statement

Hello, my name is {insert name here} I'm calling from the {insert county name} Department of Public Health. May I please speak with {insert patient's name}?
---If patient is not available to talk ***Go to question 2***
---If patient available ***Continue with introductory note***

I'm calling you again to ask you some more specific questions in connection with {insert event/restaurant name} you mentioned attending. I would like to ask you a few questions about the foods eaten before becoming ill. It will only take a few minutes of your time. It may be helpful to have a calendar to refer to during the interview.

1. Would you be willing to answer a few questions right now?
   ☐ Yes ***skip to question 3***
   ☐ No ***continue to question 2***
2. Is there a more convenient time when I can call back?
   ☐ Yes ***complete the call back information box below***

Call back information:
Day: _____ Time: _____ am/pm (circle one)
Phone: _____

☐ No ***Thank them for their time***

Ms./Mr. {insert patient name here} I am going to begin by asking you for some general demographic information questions.

3. ***Go up to the demographic section and fill out any remaining information if needed or go to question 4.***

ILLNESS HISTORY

I am now going to ask you a few questions regarding your illness history

4. Did you attend the "*Fundraising Event"* on 2/2/08
   ☐ Yes ***Continue to question 5***
   ☐ No ***Skip to question 7***

5. What time did you attend the "*Fundraising Event"?*
   From: _____:_____ to ____:____ AM/PM

6. Were you ill ***before*** attending or eating at the "*Fundraising Event?*
   ☐ Yes ***Skip to question 10***
   ☐ No ***Continue to question 7***

7. Did you eat at the "*XXX" on Sun 2/3 or Mon 2/4*?
   ☐ Yes ***Continue to question 8***
   ☐ No ***Skip to question 9***

8. On what date(s) did you eat at the *"XXX"?*
   Date:___/___/___ Day of Week:_____ Time:_____:_____AM/PM
   Date:___/___/___ Day of Week:_____ Time:____:_____AM/PM

If answered NO to Q4 AND Q7 (ie: did not eat at either the "Event" or the "XXX") then ask the following 5 day food history – otherwise continue on to illness history section.

9. **Food History – no menu**

This section asks you about foods you have eaten recently. It may be helpful to have a calendar to refer to for this section. I understand you may not remember everything that you ate for each meal, but please take your time and list the items to the best of your ability. Remember to include condiments such as ketchup, mustard, relish, cream, sugar, etc. and if you added ice to your beverages.

Note: Ask about the day of illness and the four days before the illness

****If the respondent cannot recall what he/she ate for a particular meal, ask what he/she would usually eat for that meal.***

I'll begin with {insert day} and work back from there.

Meal	Ate at home?	If ate outside home, specify location	Food eaten *(include condiments, ice, etc)*

Day of week: _________ **Date:** ____/____/____	☐ **Breakfast**	**Yes 1** **No 0**	________________	
				______________________________
	☐ **Lunch**	**Yes 1** **No 0**	________________	______________________________
	☐ **Dinner**	**Yes 1** **No 0**	________________	______________________________
	☐ **Other**	**Yes 1** **No 0**	________________	______________________________
	Meal	**Ate at home?**	**If ate outside home, specify location**	**Food eaten** ***(include condiments, ice, etc)***
Day of week: _________ **Date:** ____/____/____	☐ **Breakfast**	**Yes 1** **No 0**	________________	
				______________________________
	☐ **Lunch**	**Yes 1** **No 0**	________________	______________________________
	☐ **Dinner**	**Yes 1** **No 0**	________________	______________________________
	☐ **Other**	**Yes 1** **No 0**	________________	______________________________
	Meal	**Ate at home?**	**If ate outside home, specify location**	**Food eaten** ***(include condiments, ice, etc)***
Day of week: _________ **Date:** ____/____/____	☐ **Breakfast**	**Yes 1** **No 0**	________________	
				______________________________
	☐ **Lunch**	**Yes 1** **No 0**	________________	______________________________
	☐ **Dinner**	**Yes 1** **No 0**	________________	______________________________
	☐ **Other**	**Yes 1** **No 0**	________________	______________________________
Day of week: _________ **Date:** ____/____/____	☐ **Breakfast**	**Yes 1** **No 0**	________________	
				______________________________
	☐ **Lunch**	**Yes 1** **No 0**	________________	______________________________
	☐ **Dinner**	**Yes 1** **No 0**	________________	______________________________
	☐ **Other**	**Yes 1** **No 0**	________________	______________________________

Day of week:					
_____	□ **Breakfast**	**Yes**	**1**	_____	
Date:		**No**	**0**		
____/____/____					_____
		Yes	**1**		
	□ **Lunch**	**No**	**0**	_____	_____
		Yes	**1**		
	□ **Dinner**	**No**	**0**	_____	_____
		Yes	**1**		
	□ **Other**	**No**	**0**	_____	_____

10. When did the illness begin? (If respondent can't remember, ask for an approximation)
Date: ____/____/_____ Day of week: _____ Time: ____:____ AM/PM

11. When did the illness end? Specifically, on what day were you able to resume your daily activities?
Date: ____/____/_____
☐ Ongoing

12. Do you know of anyone else who has been ill with similar symptoms during the last week of Jan?
☐ Yes ☐ No ***Continue to Food-History-Menu Section***
12a. If **YES**, could you please tell us who they were and how to contact them?

Name	**Relationship**	**Contact#**	**Onset date of symptoms**	**Duration of illness**
1. _____	_____	(___) ___-_____	_____	_____
2. _____	_____	(___) ___-_____	_____	_____
3. _____	_____	(___) ___-_____	_____	_____
4. _____	_____	(___) ___-_____	_____	_____

Note: The above contacts need to be interviewed

Now I will read a more complete list of symptoms. You may or may not have experienced these during your illness. ***Note: If one of the symptoms below was one of the respondent's first three symptoms, circle appropriate code and move on to the next symptom. Be sure to obtain additional information, if appropriate, for symptoms requiring more information, such as fever or diarrhea.***
Did you have…?

	Yes	No	Can't remember
13. Fever	1	0	9
12a. If **YES**, what was your highest temperature? _____ F or C			
14. Diarrhea (*unformed, loose, or liquid bowel movement*)	1	0	9
If **YES**, was it:			
14a. bloody?	1	0	9

14b. watery?	1	0	9
14c. did it contain mucous?	1	0	9
14d. how many days did you have diarrhea? _____			
14e. how many times did you have diarrhea in 1 day? _____ *(max # of times per day)*			
15. Nausea	1	0	9
16. Vomiting	1	0	9
17. Bloating	1	0	9
18. Dehydration	1	0	9
19. Abdominal cramps	1	0	9
20. Chills	1	0	9
21. Cough	1	0	9
22. Headache	1	0	9
23. Lack of appetite	1	0	9
24. Malaise *(general feeling of illness or sickness, run down)*	1	0	9
25. Muscle aching	1	0	9

26. Did you seek medical attention at a hospital, urgent care center, and/or from a provider? ***(Circle appropriate code)***

Yes	1	***(Continue to question 26a)***
No	0	***(Skip to question 27)***
Can't remember	9	***(Skip to question 27)***

If **YES**,

26a. When did you seek medical attention?

Date: ____/____/____ Day of week: _____ Time: ____:____ AM/PM

26b. What was the name of the hospital or urgent care center? _____

Note: Circle '1' for Yes, '0' for No, or '9' for can't remember and insert a date if known.

Did the physician…?	**Yes**	**No**	**Can't remember**	**Date**
26c. Get a stool sample?	1	0	9	___/____/____
26d. Do any other tests?	1	0	9	___/____/____
26e. If **YES**, what other tests did the provider do? _____				
26f. Did the provider tell you what your illness was?	1	0	9	___/____/____
26g. If **YES**, what was it? _____				
26h. Did the provider give or prescribe any medications?	1	0	9	
26i. If **YES**, what medications did the provider give or prescribe? _____				

27. **If ate at FUNDRAISER EVENT ask the following:**

The Food History section asks you about foods you may have eaten at the <u>Fundraiser Event.</u> I understand you may not remember everything you ate, but please take your time and be as accurate as possible. I am going to read food items from the Fundraiser Event and you tell me if you ate them or not.

<u>FOOD HISTORY – MENU</u>

Food Item			
___Hot Dogs_____	☐ Yes	☐ No	☐ Do Not Remember
___ BBQ Beef Tips_____ _____	☐ Yes	☐ No	☐ Do Not Remember
___Classic Green Salad_____	☐ Yes	☐ No	☐ Do Not Remember
____Buttermilk Italian Dressing_____	☐ Yes	☐ No	☐ Do Not Remember
____Ranch Style Beans_____	☐ Yes	☐ No	☐ Do Not Remember
____Salsa_____	☐ Yes	☐ No	☐ Do Not Remember
____Flour Tortillas_____	☐ Yes	☐ No	☐ Do Not Remember
____Soft Serve Ice Cream_____	☐ Yes	☐ No	☐ Do Not Remember
_____Water_____	☐ Yes	☐ No	☐ Do Not Remember
____Beer_____	☐ Yes	☐ No	☐ Do Not Remember
_____Wine_____	☐ Yes	☐ No	☐ Do Not Remember
____Soft Drinks_____	☐ Yes	☐ No	☐ Do Not Remember
_____Chili_____	☐ Yes	☐ No	☐ Do Not Remember
____Other:_____	☐ Yes	☐ No	☐ Do Not Remember
____Other:_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember

28. **If ate at XXX ask the following:**

The Food History section asks you about foods you may have eaten at <u>XXX.</u> I understand you may not remember everything you ate, but please take your time and be as accurate as possible. I am going to read food items from the Hospice Event and you tell me if you ate them or not.

<u>FOOD HISTORY – MENU</u>

Food Item			
SUNDAY 2/3/08:			
___Turkey_____	☐ Yes	☐ No	☐ Do Not Remember
___ Gravy_____ _____	☐ Yes	☐ No	☐ Do Not Remember
___Sandwiches_____	☐ Yes	☐ No	☐ Do Not Remember
___Eggs_____	☐ Yes	☐ No	☐ Do Not Remember
___Toast_____	☐ Yes	☐ No	☐ Do Not Remember
___Sausage_____	☐ Yes	☐ No	☐ Do Not Remember
___Pastries_____	☐ Yes	☐ No	☐ Do Not Remember
___Cereal_____	☐ Yes	☐ No	☐ Do Not Remember
___Fruit_____	☐ Yes	☐ No	☐ Do Not Remember

___Coffee____ _____	☐ Yes	☐ No	☐ Do Not Remember
___Milk_____	☐ Yes	☐ No	☐ Do Not Remember
___Juice_____	☐ Yes	☐ No	☐ Do Not Remember
___Beef Stew_____	☐ Yes	☐ No	☐ Do Not Remember
___Mac and Cheese w/Ham_____	☐ Yes	☐ No	☐ Do Not Remember
___Spaghettios_____	☐ Yes	☐ No	☐ Do Not Remember
____Hot Dogs_____	☐ Yes	☐ No	☐ Do Not Remember
____Chicken Enchilada_____	☐ Yes	☐ No	☐ Do Not Remember
___Cream of Chicken Soup_____	☐ Yes	☐ No	☐ Do Not Remember
___Salad_____	☐ Yes	☐ No	☐ Do Not Remember
___Pudding_____	☐ Yes	☐ No	☐ Do Not Remember
___Hot Tea_____	☐ Yes	☐ No	☐ Do Not Remember
____Other:_____ _____	☐ Yes	☐ No	☐ Do Not Remember
___ Other:_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____ _____	☐ Yes	☐ No	☐ Do Not Remember

MONDAY 2/4/08:

____Bread _____	☐ Yes	☐ No	☐ Do Not Remember
____BBQ Tri Tip Beef_____	☐ Yes	☐ No	☐ Do Not Remember
____Salsa_____	☐ Yes	☐ No	☐ Do Not Remember
____Veggies_____	☐ Yes	☐ No	☐ Do Not Remember
____Salad_____	☐ Yes	☐ No	☐ Do Not Remember
_____Fruit_____	☐ Yes	☐ No	☐ Do Not Remember
____Pastries_____	☐ Yes	☐ No	☐ Do Not Remember
_____Juice_____	☐ Yes	☐ No	☐ Do Not Remember
____Choc. Milk_____	☐ Yes	☐ No	☐ Do Not Remember
_____Oatmeal__ _____	☐ Yes	☐ No	☐ Do Not Remember
_____Toast_____	☐ Yes	☐ No	☐ Do Not Remember
____Fruit_____	☐ Yes	☐ No	☐ Do Not Remember
____Coffee_____	☐ Yes	☐ No	☐ Do Not Remember
____Milk_____	☐ Yes	☐ No	☐ Do Not Remember
____Tortilla Chips_____	☐ Yes	☐ No	☐ Do Not Remember
____Cheese_____	☐ Yes	☐ No	☐ Do Not Remember
____Tuna_____ _____	☐ Yes	☐ No	☐ Do Not Remember
____Other:_____	☐ Yes	☐ No	☐ Do Not Remember
____Other:_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember
_____	☐ Yes	☐ No	☐ Do Not Remember

FOOD HANDLERS

29. Are you involved in any type of food handling preparation for {insert event/restaurant name}?

☐ Yes ***Continue to question 10***
☐ No ***Skip to question 19***

30. What days did you work during the week {insert dates}?
Date(s): _____

31. Are you a server/waiter? ☐ Yes ☐ No ☐ Do Not Remember
12a. If **YES**, when: _____ *(week before date of event/suspect meal)*

32. Are you a bartender? ☐ Yes ☐ No ☐ Do Not Remember
13a. If **YES**, when: _____ *(week before date of event/suspect meal)*

33. Were you involved in hot food preparation? ☐ Yes ☐ No ☐ Do Not Remember
14a. If **YES**, describe: _____
14b. If **YES**, when: _____ *(week before date of event/suspect meal)*

34. Were you involved in cold food preparation? ☐ Yes ☐ No ☐ Do Not Remember
15a. If **YES**, describe: _____
15b. If **YES**, when: _____ *(week before date of event/suspect meal)*

35. Were you involved in salad bar/buffet preparation? ☐ Yes ☐ No ☐ Do Not Remember
16a. If **YES**, describe: _____
16b. If **YES**, when: _____ *(week before date of event/suspect meal)*

36. Other food handling/preparation involvement ☐ Yes ☐ No ☐ Do Not Remember
36a. If **YES**, describe: _____
36b. If **YES**, when: _____ *(week before date of event/suspect meal)*

37. If you were ill, did you notify management that you were ill?
☐ Yes ***For all answers continue to Stool Specimen section***
☐ No
☐ Do Not Remember
☐ Not ill, NA

STOOL SPECIMEN

Note: If the respondent did not experience any gastrointestinal symptoms such as nausea, vomiting or diarrhea please do not ask for a stool sample. If the respondent has already provided a stool sample to his/her health care provider (see general information section) be sure to get contact information of the provider so that we can have the sample forwarded to ASL.

Provider Contact Information:

Name: _____ Phone #: (____) _____ - _____

Address:

_____

Street Suite No.

_____ _____ _____

City State Zip

If the respondent did experience gastrointestinal symptoms but didn't provide stool sample:
In order to help identify the cause of your illness, it would be helpful if we could get a stool sample from you

38. Would you be willing to provide a stool sample for testing? ☐ Yes ☐ No

38a. If **YES**, when/where should we drop off the kit with instructions for the specimen collection

_____

Instructions will be included in the kit on how to properly collect and store the sample. Once you have obtained the stool sample, please call {insert appropriate contact} at {contact's phone number} during regular business hours. Please remember to keep the sample in the refrigerator, not the freezer.

Questions or Concerns?
If you have any additional questions or concerns regarding this investigation, please call {insert appropriate contact name} at {contact's phone number}, during regular business hours. Thank you for your continued participate in this questionnaire, the information you provided will be used to help us in this investigation.

*This questionnaire is an adaptation of the standardized foodborne disease outbreak questionnaire developed by the Minnesota Department of Health, the hypothesis generating questionnaire for gastroenteritis complaints from the Infectious Disease Control Unit at the Texas Department of State Health Services and the Maricopa County Department of Public Health standard questionnaire.

NORS Reporting Form

General

National Outbreak Reporting System

Foodborne Disease Transmission, Person-to-Person Disease Transmission, Animal Contact

This form is used to report enteric foodborne, person-to-person, and animal contact-related disease outbreak investigations. This form has 5 sections, General, Laboratory, Person to Person, Animal contact, and Food, as indicated by tabs at the top of each page. ***Complete the General and Laboratory tabs for all modes of transmission and complete additional sections as indicated by the mode of transmission.*** *Please complete as much of all sections as possible.*

CDC USE ONLY

CDC Report ID	State Report ID

Form Approved
OMB No. 0920-0004

General Section

Primary Mode of Transmission *(check one)*

- ☐ Food *(Complete General, Lab, and Food tabs)*
- ☐ Water *(Complete CDC 52.12)*
- ☐ Animal contact *(Complete General, Lab, and Animal Contact tabs)*
- ☐ Person-to-person *(Complete General, Lab, and Person-to-Person tabs)*
- ☐ Environmental contamination other than food/water *(Complete General and Lab tabs)*
- ☐ Indeterminate/Other/Unknown *(Complete General and Lab tabs)*

Investigation Methods *(check all that apply)*

- ☐ Interviews only of ill persons
- ☐ Case-control study
- ☐ Cohort study
- ☐ Food preparation review
- ☐ Water system assessment: Drinking water
- ☐ Water system assessment: Nonpotable water
- ☐ Treated or untreated recreational water venue assessment
- ☐ Investigation at factory/production/treatment plant
- ☐ Investigation at original source (e.g., farm, water source, etc.)
- ☐ Food product or bottled water traceback
- ☐ Environment/food/water sample testing
- ☐ Other

Comments

Dates (mm/dd/yyyy)

Date first case became ill *(required)* ____/_____/_____ Date last case became ill ____/_____/_____

Date of initial exposure ____/_____/_____ Date of last exposure ____/_____/_____

Date of report to CDC (other than this form) ____/_____/_____

Date of notification to State/Territory or Local/Tribal Health Authorities ____/_____/_____

Geographic Location

Reporting state: _____

☐Exposure occurred in multiple states
☐Exposure occurred in a single state, but cases resided in multiple states
Other states: _____

Reporting county: _____

☐Exposure occurred in multiple counties in reporting state
☐Exposure occurred in a single county, but cases resided in multiple counties in reporting state
Other counties: _____

City/Town/Place of exposure: _____

Do not include proprietary or private facility names

Primary Cases

Number of Primary Cases		Sex *(estimated percent of the primary cases)*	
# Lab-confirmed cases	(A)	Male	%
# Probable cases	(B)		
# Estimated total primary ill		Female	%

	# Cases	Total # of cases for whom info is available	Approximate percent of primary cases in each age group			
# Died			<1 year	%	20–49 years	%
# Hospitalized			1–4 years	%	50–74 years	%
# Visited Emergency Room			5–9 years	%	≥ 75 years	%
# Visited health care provider (excluding ER visits)			10–19 years	%	Unknown	%

General

Incubation Period, Duration of Illness, Signs or Symptoms for Primary Cases only

Incubation Period *(circle appropriate units)*			**Duration of Illness** *(among recovered cases-circle appropriate units)*		
Shortest		Min, Hours, Days	Shortest		Min, Hours, Days
Median		Min, Hours, Days	Median		Min, Hours, Days
Longest		Min, Hours, Days	Longest		Min, Hours, Days
Total # of cases for whom info is available			Total # of cases for whom info is available		
☐ Unknown incubation period			☐ Unknown duration of illness		

Signs or Symptoms *(*refer to terms from appendix, if appropriate, to describe other common characteristics of cases)*

Feature	# Cases with signs or symptoms	Total # cases for whom info available
Vomiting		
Diarrhea		
Bloody stools		
Fever		
Abdominal cramps		
HUS		
Asymptomatic		
*		
*		
*		

Secondary Cases

Mode of Secondary Transmission *(check one)*	**Number of Secondary Cases**	
☐ Food ☐ Water ☐ Animal contact ☐ Person-to-person ☐ Environmental contamination other than food/water ☐ Indeterminate/Other/Unknown	# Lab-confirmed secondary cases	(A)
	# Probable secondary cases	(B)
	Total # of secondary cases	
	Total # of cases (Primary + Secondary)	

Environmental Health Specialists Network *(if applicable)*

EHS-Net Evaluation ID: 1.) _____ 2.) _____ 3.) _____

Traceback *(for food and bottled water only, not public water)*

☐ Please check if traceback conducted

Source name *(If publicly available)*	**Source type** *(e.g. poultry farm, tomato processing plant, bottled water factory)*	**Location of source** State	Country	**Comments**

Recall

☐ Please check if any food or bottled water product was recalled

Type of item recalled:

Comments:

Reporting Agency

Agency name: _____ E-mail: _____

Contact name: _____ Contact title: _____

Phone no.: _____ Fax no.: _____

Remarks *Briefly describe important aspects of the outbreak not covered above. Please indicate if any adverse outcomes occurred in special populations (e.g., pregnant women, immunocompromised persons)*

Laboratory | Person-to-Person | Animal Contact

Laboratory Section

Etiology known? ☐ Yes ☐ No

If etiology is *unknown,* were patient specimens collected? ☐ Yes ☐ No ☐ Unknown

If *yes*, how many specimens collected? (provide numeric value) _____

What were they tested for? *(check all that apply)* ☐ Bacteria ☐ Chemicals/Toxins ☐ Viruses ☐ Parasites

Etiology

(Name the bacterium, chemical/toxin, virus, or parasite. If available, include the serotype and other characteristics such as phage type, virulence factors, and metabolic profile. Confirmation criteria available at http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm or MMWR2000/Vol. 49/SS-1/App. B)

Genus	Species	Serotype	Confirmed outbreak etiology	Other Characteristics	Detected in*	# Lab-confirmed cases
			☐ yes			
			☐ yes			
			☐ yes			
			☐ yes			

*Detected in *(choose all that apply)*: 1 - patient specimen 2 - food specimen 3 - environment specimen 4 - food worker specimen

Isolates

(For bacterial pathogens, provide a representative for each distinct pattern; provide lab ID for all specimens submitted for viral sequencing)

State Lab ID	PulseNet Outbreak Code	CDC PulseNet Pattern Designation for Enzyme 1	CDC PulseNet Pattern Designation for Enzyme 2	Other Molecular Designation	Other Molecular Designation

Person to Person

Major setting of exposure *(choose one)*

☐ Camp ☐ Hotel ☐ Private setting (residential home) ☐ School
☐ Child day care ☐ Nursing home ☐ Religious facility ☐ Ship
☐ Community-wide ☐ Prison or detention facility ☐ Restaurant ☐ Workplace
☐ Hospital ☐ Other, please specify: _____

Attack rates for major settings of exposure

Group *(based on setting)*	Estimated exposed in major setting*	Estimated ill in major setting	Crude attack rate *[(estimated ill / estimated exposed) x 100]*
residents, guests, passengers, patients, etc.			
staff, crew, etc.			

*e.g., number of persons on ship, number of residents in nursing home or affected ward

Other settings of exposure *(choose all that apply)*

☐ Camp ☐ Hotel ☐ Private setting (residential home) ☐ School
☐ Child day care ☐ Nursing home ☐ Religious facility ☐ Ship
☐ Community-wide ☐ Prison or detention facility ☐ Restaurant ☐ Workplace
☐ Hospital ☐ Other, please specify: _____

Animals and their environment

Setting of exposure	Type of animal	Remarks

Food

Food-specific data

☐ Food vehicle undetermined Total # of cases exposed to implicated food _____

Food	1	2	3
Name of food *(excluding any preparation)*			
Ingredient(s) *(enter all that apply)*			
Contaminated ingredients *(enter all that apply)*			
Reason(s) suspected *(enter all that apply from list in appendix)*			
Method of processing *(enter all that apply from list in appendix)*			
Method of preparation *(select one from list in appendix)*			
Level of preparation *(select one from list in appendix)*			
Contaminated food imported to US?	☐ Yes, Country_____ ☐ Yes, Unknown ☐ No	☐ Yes, Country_____ ☐ Yes, Unknown ☐ No	☐ Yes, Country_____ ☐ Yes, Unknown ☐ No
Was product *both* produced under domestic regulatory oversight *and* sold?	☐ Yes ☐ No ☐ Unknown	☐ Yes ☐ No ☐ Unknown	☐ Yes ☐ No ☐ Unknown

Location where food was prepared *(Check all that apply)*		**Location of exposure (where food was eaten)** *(Check all that apply)*	
☐ **Restaurant – 'Fast-food'** *(drive up service or pay at counter)*	☐ **Nursing home, assisted living facility, home care**	☐ **Restaurant – 'Fast-food'** *(drive up service or pay at counter)*	☐ **Nursing home, assisted living facility, home care**
☐ **Restaurant – Sit-down dining**	☐ **Hospital**	☐ **Restaurant – Sit-down dining**	☐ **Hospital**
☐ **Restaurant – Other or unknown type**	☐ **Child day care center**	☐ **Restaurant – Other or unknown type**	☐ **Child day care center**
☐ **Private home**	☐ **School**	☐ **Private home**	☐ **School**
☐ **Banquet Facility** *(food prepared and served on-site)*	☐ **Prison, jail**	☐ **Banquet Facility** *(food prepared and served on-site)*	☐ **Prison, jail**
☐ **Carterer** *(food prepared off-site from where served)*	☐ **Church, temple, religious location**	☐ **Carterer** *(food prepared off-site from where served)*	☐ **Church, temple, religious location**
☐ **Fair, festival, other temporary or mobile services**	☐ **Camp**	☐ **Fair, festival, other temporary or mobile services**	☐ **Camp**
☐ **Grocery store**	☐ **Picnic**	☐ **Grocery store**	☐ **Picnic**
☐ **Workplace, not cafeteria**	☐ **Other** *(describe in Prepared/Remarks)*	☐ **Workplace, not cafeteria**	☐ **Other** *(describe in Eaten/Remarks)*
☐ **Workplace cafeteria**	☐ **Unknown**	☐ **Workplace cafeteria**	☐ **Unknown**
Remarks:		**Remarks:**	

Food

Contributing Factors *(Check all that contributed to this outbreak)*

☐ Contributing factors unknown

Contamination Factor

☐ C1 ☐ C2 ☐ C3 ☐ C4 ☐ C5 ☐ C6 ☐ C7 ☐ C8 ☐ C9 ☐ C10 ☐ C11 ☐ C12 ☐ C13 ☐ C14 ☐ C15 ☐ C-N/A

Proliferation/Amplification Factor *(bacterial outbreaks only)*

☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5 ☐ P6 ☐ P7 ☐ P8 ☐ P9 ☐ P10 ☐ P11 ☐ P12 ☐ P-N/A

Survival Factor

☐ S1 ☐ S2 ☐ S3 ☐ S4 ☐ S5 ☐ S-N/A

The confirmed or suspected point of contamination *(Check one)*

☐ Before preparation ☐ Preparation

If 'before preparation': ☐ Pre-Harvest ☐ Processing ☐ Unknown

Reason suspected *(Check all that apply)*

☐ Environmental evidence	☐ Laboratory evidence
☐ Epidemiologic evidence	☐ Prior experience makes this a likely source

Was food-worker implicated as the source of contamination? ☐ Yes ☐ No

If yes, please check only one of the following

- ☐ Laboratory ***and*** epidemiologic evidence
- ☐ Epidemiologic evidence
- ☐ Laboratory evidence
- ☐ Prior experience makes this a likely source

School Questions

(Complete this section only if school is checked in either sections "Location where food was prepared" or "Location of exposure (where food eaten)")

1. Did the outbreak involve a single or multiple schools?

☐ Single

☐ Multiple (If *yes*, number of schools____)

2. School characteristics *(for all involved students in all involved schools)*

a. Total approximate enrollment

_____(number of students)

☐ Unknown or undetermined

b. Grade level(s)

☐ Preschool

☐ Grade school *(grades K-12)*

Please check all grades affected: ☐ K ☐ 1st ☐ 2nd ☐ 3rd ☐ 4th ☐ 5th ☐ 6th ☐ 7th ☐ 8th ☐ 9th ☐ 10th ☐ 11th ☐ 12th

☐ College/university/technical school

☐ Unknown or Undetermined

c. Primary funding of involved schools

☐ Public

☐ Private

☐ Unknown

3. Describe the preparation of the implicated item: *(check all that apply)*

☐ Heat and serve *(item mostly prepared or cooked off site, reheated on-site)*
☐ Served a-la-carte
☐ Serve only *(preheated or served cold)*
☐ Cooked on-site using primary ingredients
☐ Provided by a food service management company
☐ Provided by a fast-food vendor
☐ Provided by a pre-plate company
☐ Part of a club or fundraising event
☐ Made in the classroom
☐ Brought by a student/teacher/parent
☐ Other (*describe in General/Remarks*)
☐ Unknown or Undetermined

4. How many times has the state, county or local health department inspected this school cafeteria or kitchen in the 12 months before the outbreak?*

☐ Once
☐ Twice
☐ More than two times
☐ Not inspected
☐ Unknown or Undetermined

5. Does the school have a HACCP plan in place for the school feeding program?*

☐ Yes
☐ No
☐ Unknown or Undetermined

*If multiple schools are involved, please answer according to the most affected school

Food

6. Was implicated food item provided to the school through the National School Lunch/Breakfast Program?

☐ Yes
☐ No
☐ Unknown or Undetermined

If *yes*, was the implicated food item donated/purchased by:

☐ USDA through the Commodity Distribution Program
☐ The state/school authority
☐ Other (*describe in General/Remarks*)
☐ Unknown or Undetermined

Ground Beef

1. What percentage of ill persons (*for whom information is available*) ate ground beef raw or undercooked? _____ %

2. Was ground beef case-ready? ☐ Yes ☐ No ☐ Unknown
(Case-ready ground beef is meat that comes from a manufacturer packaged for sale that is not altered or repackaged by the retailer)

3. Was the beef ground or reground by the retailer?
☐ Yes ☐ No ☐ Unknown
If yes, was anything added to the beef during grinding (*such as shop trim or any product to alter the fat content*)?: _____

Additional *Salmonella* Questions
(Complete this section for Salmonella outbreaks)

1. Phage type(s) of patient isolates:

_____ *if RDNC* then include #* _____

_____ *if RDNC* then include #* _____

_____ *if RDNC* then include #* _____

_____ *if RDNC* then include #* _____

* Reacts, Does Not Conform

Eggs

1. Were eggs *(check all that apply)*

☐ in shell, unpasteurized?
☐ in shell, pasteurized?
☐ packaged liquid or dry?
☐ stored with inadequate refrigeration during or after sale?
☐ consumed raw?
☐ consumed undercooked?
☐ pooled?

2. Was Salmonella enteritidis found on the farm? ☐ Yes ☐ No ☐ Unknown

Comment *(e.g., eggs and patients isolates matched by phage type)*: _____

National Outbreak Reporting System (NORS) Appendix

Signs and Symptoms: **Choose all that apply**. NORS users may enter new signs and symptoms if it is not listed below.

Abdominal Cramps
Alopecia (absence of hair)
Anaphylaxis
Anorexia
Appendicitis
Arthralgia
Asymptomatic
Ataxia
Backache
Bedridden
Bloating
Blood pressure flux
Bloody Stools
Bloody vomitus
Blurred vision
Body ache
Bradycardia
Bullous skin lesions
Burning
Burns in mouth
Chest pain
Chills
Coma
Congestion
Cough
Dark Urine
Dehydration
Descending paralysis
Diarrhea
Difficulty breathing
Difficulty swallowing
Dilated pupils
Diplopia (double vision)
Disoriented
Dizziness
Dry mouth
Dysconjugate gaze
Dysesthesia (impairment of a sense, esp. touch)
Ear ache
Ears ringing
Edema
Eosinophil
Erythemia
Excess saliva
Eye problems
Facial weakness
Faintness
Fasiculations (bundling nerve/muscle fibers)
Fatigue
Fever
Flushing
Gas
Hallucinations
Headache
Heartburn
Hemorrhage
Histamine reaction
Hives
Hoarse
Hot flash/flush
HUS (Hemolytic Uremic Syndrome)
Hypotension
Insomnia
Itching
Jaundice
Joint pain
Lethargy
Light-headed
Liver necrosis
Loss of appetite
Loss of consciousness
Lymphandenopathy
Malaise
Memory loss
Meningitis
Mucus
Mucus in stool
Muscle breakdown
Muscle fatigue
Muscle spasm
Myalgia
Nausea
Neurological symptoms
Nightmares
Numbness
Oral Swelling
Pain
Palpitations
Paralysis
Paresthesia
Periorbital edema
Pharyngitis
Photophobia
Prostration
Ptosis
Quadriplegia
Rapid pulse
Rash
Redness
Respiratory arrest
Rhinitis
Seizures
Septicemia
Shakes
Shock
Shortness of breath
Sore throat
Speech difficulty
Stiff neck
Stiffness
Stomach ache
Sweating
Swelling
Swollen glands
Swollen tongue
Tachycardia
Taste Disturbance
Temperature reversal
Temperature variant
Thick tongue
Thirst
Thrombocytopenia
Tingling
Trembling
TTP (Thrombotic thrombocytopenic purpura)
Urinary problems
Urticaria
Vomiting
Weak pulse
Weakness
Weight loss
Wheezing

Last updated: 12/31/2008

Reason(s) suspected: **Choose all that apply.**
1 – Statistical evidence from epidemiological investigation
2 – Laboratory evidence (e.g., identification of agent in food)
3 – Compelling supportive information
4 – Other data (e.g., same phage type found on farm that supplied eggs)
5 – Specific evidence lacking but prior experience makes it likely source

Method of processing (Prior to point-of-service: Processor): **Choose all that apply.**
P1 – Pasteurized (e.g., liquid milk, cheese, and juice etc)
P2 – Unpasteurized (e.g., liquid milk, cheese, and juice etc)
P3 – Shredded or diced produce
P4 – Pre-packaged (e.g., bagged lettuce or other produce)
P5 – Irradiation
P6 – Pre-washed
P7 – Frozen
P8 – Canned
P9 – Acid treatment (e.g., commercial potato salad with vinegar, etc)
P10 – Pressure treated (e.g., oysters, etc)
P11 – None or Unknown

Method of Preparation (At point-of-service: Retail: restaurant, food store): **Select only one**
R1 – Prepared in the home
R2 – Ready to eat food- No manual preparation, No cook step. (e.g., sliced cheese, pre-packaged deli meats; whole raw fruits; raw oysters, etc)
R3 – Ready to eat food – Manual preparation, No cook step. (e.g., fresh vegetables, cut fresh fruits, chicken salad made from canned chicken, ect)
R4 – Cook and Serve Foods: Immediate service. (e.g., soft-cooked eggs, hamburgers, etc)
R5 – Cook and hot hold prior to service. (e.g., fried chicken, soups, hot vegetables, hot dogs, mashed potatoes, etc)
R6 – Advance preparation: Cook, cool, serve (e.g., sliced roast beef from a whole cooked roast, etc)
R7 – Advance preparation: Cook, cool, reheat, serve (e.g., lasagna, casseroles, soups, gravies, sauces, chili, etc)
R8 – Advance preparation: Cook, cool, reheat, hot hold, serve (e.g., chili, refried beans, etc)
R9 – Advance preparation: Cook-chill and Reduced Oxygen Packaging (ROP) (e.g., sauces, gravies, cheeses, etc packaged under ROP)
R10 – None/ Unknown

Level of preparation: **Select only one**
1 – Foods eaten raw with minimal or no processing. (e.g., washing, cooling)
2 – Foods eaten raw with some processing. (e.g., no cooking, fresh cut and/or packaged raw)
3 – Foods eaten heat processed. (e.g., cooked: a microbiological kill step was involved in processing)

Last updated: 12/31/2008

Contributing Factors: **Choose all that apply.**

Contamination Factors:
C1 – Toxic substance part of the tissue
C2 – Poisonous substance intentionally/deliberately added
C3 – Poisonous substance accidentally/inadvertently added
C4 – Addition of excessive quantities of ingredients that are toxic in large amounts
C5 – Toxic container
C6 – Contaminated raw product – food was intended to be consumed after a kill step
C7 – Contaminated raw product – food was intended to be consumed raw or undercooked/under-processed
C8 – Foods originating from sources shown to be contaminated or polluted (such as a growing field or harvest area)
C9 – Cross-contamination of ingredients (cross-contamination does not include ill food workers)
C10 – Bare-hand contact by a food handler/worker/preparer who is suspected to be infectious
C11 – Glove-hand contact by a food handler/worker/preparer who is suspected to be infectious
C12 – Other mode of contamination (excluding cross-contamination) by a food handler/worker/preparer who is suspected to be infectious
C13 – Foods contaminated by non-food handler/worker/preparer who is suspected to be infectious
C14 – Storage in contaminated environment
C15 – Other source of contamination
C-N/A – Contamination Factors - Not Applicable

Proliferation/Amplification Factors:
P1 – Food preparation practices that support proliferation of pathogens (during food preparation)
P2 – No attempt was made to control the temperature of implicated food or the length of time food was out of temperature control (during food service or display of food)
P3 – Improper adherence of approved plan to use Time as a Public Health Control
P4 – Improper cold holding due to malfunctioning refrigeration equipment
P5 – Improper cold holding due to an improper procedure or protocol
P6 – Improper hot holding due to malfunctioning equipment
P7– Improper hot holding due to improper procedure or protocol
P8 – Improper/slow cooling
P9 – Prolonged cold storage
P10 – Inadequate modified atmosphere packaging
P11 – Inadequate processing (acidification, water activity, fermentation)
P12 – Other situations that promoted or allowed microbial growth or toxic production
P-N/A – Proliferation/Amplification Factors - Not Applicable

Survival Factors:
S1 – Insufficient time and/or temperature control during initial cooking/heat processing
S2 – Insufficient time and/or temperature during reheating
S3 – Insufficient time and/or temperature control during freezing
S4 – Insufficient or improper use of chemical processes designed for pathogen destruction
S5 – Other process failures that permit pathogen survival
S-N/A – Survival Factors - Not Applicable

General

National Outbreak Reporting System

Waterborne Disease Transmission

This form is used to report waterborne disease outbreak investigations. This form has 6 parts, indicated by tabs at the top of each page. Part 1 asks for the minimum or basic information about the outbreak investigation. Part 2 asks for epidemiological data and clinical specimen test results. Parts 3, 4, 5 and 6 collect information about types of water exposure (treated recreational water, untreated recreational water, drinking water, and water not intended for drinking/unknown intent). Only 1 of these 4 water exposure parts should be completed for an outbreak investigation report.

CDC USE ONLY

CDC Report ID	State Report ID

Form Approved
OMB No. 0920-0004

General Section

Primary Mode of Transmission *(check one)*

- ☐ Food *(Complete CDC 52.13)*
- ☐ Water *(Complete tabs for General, Water-General and type of water exposure)*
- ☐ Animal contact *(Complete CDC 52.13)*
- ☐ Person-to-person *(Complete CDC 52.13)*
- ☐ Environmental contamination other than food/water *(Complete CDC 52.13)*
- ☐ Indeterminate/Other/Unknown *(Complete CDC 52.13)*

Investigation Methods *(check all that apply)*

- ☐ Interviews only of ill persons
- ☐ Case-control study
- ☐ Cohort study
- ☐ Food preparation review
- ☐ Water system assessment: Drinking water
- ☐ Water system assessment: Nonpotable water
- ☐ Treated or untreated recreational water venue assessment
- ☐ Investigation at factory/production/treatment plant
- ☐ Investigation at original source (e.g., farm, water source, etc.)
- ☐ Food product or bottled water traceback
- ☐ Environment/food/water sample testing
- ☐ Other

Comments

Dates (mm/dd/yyyy)

Date first case became ill *(required)* ____/_____/_____ Date last case became ill ____/_____/_____

Date of initial exposure____/_____/_____ Date of last exposure ____/_____/_____

Date of report to CDC (other than this form) ____/_____/_____

Date of notification to State/Territory or Local/Tribal Health Authorities ____/_____/_____

Geographic Location

Reporting state: _____

- ☐Exposure occurred in multiple states
- ☐Exposure occurred in a single state but cases resided in multiple states

Other states: _____

Reporting county: _____

- ☐Exposure occurred in multiple counties in reporting state
- ☐Exposure occurred in a single county but cases resided in multiple counties in reporting state

Other counties: _____

City/Town/Place of exposure: _____

Do not include proprietary or private facility names

Primary Cases

Number of Primary Cases		Sex *(estimated percent of the primary cases)*	
# Lab-confirmed cases	(A)	Male	%
# Probable cases	(B)		
# Estimated total primary ill (if greater than sum A+B)		Female	%

	# Cases	Total # of cases for whom info is available	Approximate percent of primary cases in each age group			
# Died			<1 year	%	20–49 years	%
# Hospitalized			1–4 years	%	50–74 years	%
# Visited Emergency Room			5–9 years	%	≥ 75 years	%
# Visited health care provider (excluding ER visits)			10–19 years	%	Unknown	%

General

Incubation Period, Duration of Illness, Signs or Symptoms for Primary Cases only

Incubation Period *(circle appropriate units)*			**Duration of Illness** *(among recovered cases-circle appropriate units)*		
Shortest		Min, Hours, Days	Shortest		Min, Hours, Days
Median		Min, Hours, Days	Median		Min, Hours, Days
Longest		Min, Hours, Days	Longest		Min, Hours, Days
Total # of cases for whom info is available			Total # of cases for whom info is available		
☐ Unknown incubation period			☐ Unknown duration of illness		

Signs or Symptoms ***(*refer to terms from appendix, if appropriate, to describe other common characteristics of cases)***

Feature	# Cases with signs or symptoms	Total # cases for whom info available
Vomiting		
Diarrhea		
Bloody stools		
Fever		
Abdominal cramps		
HUS		
Asymptomatic		
*		
*		
*		

Secondary Cases

Mode of Secondary Transmission *(check one)*	**Number of Secondary Cases**	
☐ Food ☐ Water ☐ Animal contact ☐ Person-to-person ☐ Environmental contamination other than food/water ☐ Indeterminate/Other/Unknown	# Lab-confirmed secondary cases	(A)
	# Probable secondary cases	(B)
	Total # of secondary cases (if greater than sum A+B)	
	Total # of cases (Primary + Secondary)	

Environmental Health Specialists Network ***(if applicable)***

EHS-Net Evaluation ID: 1.) _____ 2.) _____ 3.) _____

Traceback ***(for food and bottled water only, not public water)***

☐ Please check if traceback conducted

Source name *(If publicly available)*	**Source type** *(e.g. poultry farm, tomato processing plant, bottled water factory)*	**Location of source** State	Country	**Comments**

Recall

☐ Please check if any food or bottled water product was recalled

Type of item recalled:

Comments:

Reporting Agency

Agency name: _____ E-mail: _____

Contact name: _____ Contact title: _____

Phone no.: _____ Fax no.: _____

Remarks ***Briefly describe important aspects of the outbreak not covered above. Please indicate if any adverse outcomes occurred in special populations (e.g., pregnant women, immunocompromised persons)***

Water-General

Waterborne Disease and Outbreaks - General

Type of Water Exposure *(check ONE box)*

☐ Water intended for recreational purposes – treated venue (e.g., pool, spa/whirlpool/hot tub, spray pad)

☐ Water intended for recreational purposes – untreated venue (e.g., freshwater lake, hot spring, marine beach)

☐ Water intended for drinking (includes water used for bathing/showering)

☐ Water not intended for drinking or water of unknown intent (e.g., cooling/industrial, occupational, decorative/ display)

Geographic Location

Percent of primary cases living in reporting state : _____%

Associated Events

Was exposure associated with a specific event or gathering?

☐ Yes ☐ No ☐ Unknown

If **Yes**, what type of event or gathering was involved?

_____

_____

_____

If outbreak occurred during a defined event, dates of event:

Start date: ____/_____/_____ (mm/dd/yyyy) End date: ____/_____/_____ (mm/dd/yyyy)

Symptoms

For each category, indicate # of persons with:

Gastrointestinal symptoms/ conditions _____

Respiratory symptoms/ conditions _____

Skin symptoms/conditions _____

Ear symptoms/conditions _____

Eye symptoms/conditions _____

Neurologic symptoms/ conditions _____

Wound infections _____

Other, specify (e.g., hepatitis A, leptospirosis): _____

_____

Route of Entry

☐ Ingestion

☐ Contact

☐ Inhalation

☐ Other, specify:

_____

☐ Unknown

Epidemiologic Data

1. Estimated total number of persons with primary exposure: _____

2. Were data collected from comparison groups to estimate risk? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

   If ***No*** or ***Unknown***, was water the only common source shared by persons who were ill? ☐ Yes ☐ No ☐ Unknown

Exposure (Vehicle/Setting) *(e.g., pool—waterpark; hot spring; well water)*	Total # Exposed (A)	# Ill Exposed (B)	Total # Not Exposed	# Ill Not Exposed	Attack Rate (%) (B/A)	Odds Ratio	Relative Risk	p-Value *(provide exact value, if known)*	95% Confidence Interval

Attack rate for residents of reporting state: _____% **Attack rate for non-residents of reporting state:** _____%

Clinical Specimens - Laboratory Results *(refer to the laboratory findings from the outbreak investigation)*

1. Were clinical diagnostic specimens taken from persons? ☐ Yes ☐ No *(go to next tab)* ☐ Unknown *(go to next tab)*

   If **Yes**, from how many persons were specimens taken? _____

Water-General

Specimen Type*	Specimen Subtype**	Tested for § *(list all that apply)*

* Specimen Type: 1- Autopsy Specimen (specify subtype), 2-Biopsy (specify), 3-Blood, 4-Bronchial Alveolar Lavage (BAL), 5-Cerebrospinal Fluid (CSF), 6-Conjunctiva/Eye Swab, 7-Ear Swab, 8-Endotracheal Aspirate, 9-Saliva, 10-Serum, 11-Skin Swab, 12-Sputum, 13-Stool, 14-Urine, 15-Vomitus, 16-Wound Swab, 17-Unknown

** Specimen Subtype: 1-Bladder, 2-Brain, 3-Dura, 4-Hair, 5-Intestine, 6-Kidney, 7-Liver, 8-Lung, 9-Nails, 10-Skin, 11-Stomach, 12-Wound, 13-Other, 14-Unknown

§ Tested for: 1-Bacteria, 2-Chemicals/Toxins, 3-Fungi, 4-Parasites, 5-Viruses

Enter positive findings in the table below. If tests for a specific pathogen/agent were negative, please also list that pathogen/agent and fill in the Specimen Type, Specimen Subtype, Test Type, Total # of People Tested and Total # of People Positive.

Clinical Specimen Row Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype
1				
2				
3				
4				
5				

Clinical Specimen Row Number	Confirmed as Etiology ?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Specimen Type *	Specimen Subtype **
1	☐ yes				
2	☐ yes				
3	☐ yes				
4	☐ yes				
5	☐ yes				

Clinical Specimen Row Number	Test Type §	Total # People Tested	Total # People Positive
1			
2			
3			
4			
5			

* Specimen Type: 1- Autopsy Specimen (specify subtype), 2-Biopsy (specify), 3-Blood, 4-Bronchial Alveolar Lavage (BAL), 5-Cerebrospinal Fluid (CSF), 6-Conjunctiva/Eye Swab, 7-Ear Swab, 8-Endotracheal Aspirate, 9-Saliva, 10-Serum, 11-Skin Swab, 12-Sputum, 13-Stool, 14-Urine, 15-Vomitus, 16-Wound Swab, 17-Unknown

** Specimen Subtype: 1-Bladder, 2-Brain, 3-Dura, 4-Hair, 5-Intestine, 6-Kidney, 7-Liver, 8-Lung, 9-Nails, 10-Skin, 11-Stomach, 12-Wound, 13-Other, 14-Unknown

§ Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Isolates

State Lab Isolate ID	Specimen Profile 1 *(e.g., PFGE, MLVA, or genotype)*	Specimen Profile 2 *(e.g., PFGE, MLVA, or genotype)*

Rec Water-Treated

Recreational Water – Treated Venue

Recreational Water Vehicle Description

Water Vehicle Number *(e.g., 1, 2, 3)*	Water Type *(e.g., spa/whirlpool/hot tub; pool- swimming pool; pool- waterpark)*	Water Subtype *(select indoor, outdoor, or unknown)*	Setting of Exposure *(e.g., club, requiring membership; hotel/motel/lodge/inn; waterpark)*

Water Vehicle Number *(e.g., 1, 2, 3)*	USUAL Water Treatment Provided at Venue *(e.g., no treatment; coagulation; disinfection; flocculation; filtration (pool); unknown)*	Venue Treatment Subtype *(disinfection or pool filtration: e.g., UV; chlorine dioxide; bag filter; cartridge filter; unknown)*	Chlorination Subtype *(chlorine disinfection only- e.g., gaseous; sodium hypochlorite; cyanurates /stabilized chlorine)*

Water Vehicle Number *(e.g., 1, 2, 3)*	Fill Water Type *(e.g., public water supply; sea water; untreated ground or surface water; unknown)*	IF PUBLIC WATER WAS USED TO FILL, USUAL Water Treatment Provided for Fill Water Before Coming to the Venue *(e.g., no treatment; disinfection; filtration (treatment plant); unknown)*	IF PUBLIC WATER WAS USED TO FILL, Fill Water Treatment Subtype *(disinfection or pool filtration: e.g., UV; chlorine dioxide; bag filter; cartridge filter; unknown)*

Recreational Water Quality

Did the venue meet state or local recreational water quality regulations? ☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **No**, explain: _____

Was there a pool operator on the payroll with state-approved training or certification? ☐ Yes ☐ No ☐ Unknown

Laboratory Section - Recreational Water Samples from Treated Venues

Was water from treated recreational water venues tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample *(e.g., swimming pool, hot tub)*						
Additional Description of Source of Sample *(e.g., specific location, time of day, backwash sample, etc.)*						
Date *(mm/dd/yyyy)*						
Volume Tested	Number					
	Unit					
Temperature	Number					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	Number					
	Unit					
Combined Disinfectant Level *(if total and free disinfectant levels given, total - free = combined)*	Number					
	Unit					
pH						

Rec Water-Treated

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				

*** Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay**

Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Treated Venues

	Factors *(check all that apply)***	Documented/ Observed***	Suspected***
	Out of compliance with bather load/density requirements	☐	☐
PEOPLE	Primary intended use of water is by diaper/toddler-aged children (e.g., kiddie pool)	☐	☐
PEOPLE	Heavy use by child care center groups	☐	☐
PEOPLE	Fecal/vomitus accident	☐	☐
PEOPLE	Patrons continued to swim when ill or within 2 weeks of being ill	☐	☐
	Operator error	☐	☐
	Intentional contamination (explain in remarks)	☐	☐
FACILITY DESIGN	Combined pool filtration systems led to cross-contamination	☐	☐
FACILITY DESIGN	Hygiene facilities inadequate or distant (e.g., no toilets, no diaper changing facilities)	☐	☐
FACILITY DESIGN	Spray feature water demand higher than treatment system capacity so water returns to features and bypasses filtration/treatment system	☐	☐
	No supplemental disinfection installed that would have inactivated pathogen (e.g., *Cryptosporidium*)	☐	☐
	Water temperature ≥30°C (≥86°F)	☐	☐
	Cross-connection with wastewater or non-potable water	☐	☐
	Disinfectant control system malfunctioning, inadequate, or lacking (e.g., hand feed)	☐	☐
	Incorrect settings on disinfectant control system	☐	☐
	pH control system malfunctioning, inadequate, or lacking (e.g., hand feed)	☐	☐
	Incorrect settings on pH control system	☐	☐
	Filtration system malfunctioning or inadequate (e.g., low flow rate)	☐	☐
MAINTENANCE	Supplemental disinfection system malfunctioning (e.g., ultraviolet light, ozone)	☐	☐
MAINTENANCE	Insufficient system checks so breakdown detection delayed	☐	☐
MAINTENANCE	No preventive maintenance programs to reduce breakdowns	☐	☐
MAINTENANCE	Remote monitoring system in use	☐	☐
MAINTENANCE	Ventilation insufficient for indoor aquatic facilities	☐	☐
MAINTENANCE	Chemical handling error (e.g., chemical hookup, improper mixing or application)	☐	☐
	Maintenance chemicals not flushed from system before opening to swimmers	☐	☐
	Low or zero water flow combined with continuous feed of chemicals resulted in excess chemicals in water	☐	☐
	Extensive slime/biofilm formation	☐	☐
	Recent construction	☐	☐
	Cyanurate level excessive	☐	☐
	Lack of draining/cleaning	☐	☐
	Stagnant water in spa piping was aerosolized	☐	☐
	No aquatics operators on payroll who have received state/local certified training	☐	☐
POLICY AND MANAGEMENT	Untrained/inadequately trained staff on duty	☐	☐
POLICY AND MANAGEMENT	Unclear communication chain for reporting problems	☐	☐
POLICY AND MANAGEMENT	Inadequate water quality monitoring (e.g., inadequate test kit, inadequate testing frequency)	☐	☐
POLICY AND MANAGEMENT	Employee illness policies absent or not enforced	☐	☐
POLICY AND MANAGEMENT	Missing or poor chemical handling policies, practices, and training	☐	☐
POLICY AND MANAGEMENT	No operator on duty at the time of incident	☐	☐
POLICY AND MANAGEMENT	Facility falls outside aquatic health code	☐	☐
	No shock/hyperchlorination policy	☐	☐
	Other, specify:	☐	☐
	Unknown	☐	☐

**** Only check off what was found during investigation**

***** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.**

Remarks

Rec Water-Untreated

Recreational Water – Untreated Venue

Recreational Water Vehicle Description

Water Type *(e.g., canal; lake; river/stream; ocean)*	IF SPRING OR HOT SPRING, Water Subtype *(select indoor, outdoor or unknown)*	Setting of Exposure *(e.g., beach- public; camp/cabin/recreational area)*

Recreational Water Quality

Did the venue meet state or local recreational water quality regulations? ☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **No**, explain: _____

Did the venue meet Environmental Protection Agency (EPA) recreational water quality standards?

☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **No**, explain: _____

Laboratory Section - Recreational Water Samples from Untreated Venues

Was water from untreated recreational water venues tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample *(e.g., lake or stream)*						
Additional Description of Source of Sample *(e.g., specific location, time of day, etc)*						
Date *(mm/dd/yyyy)*						
Volume Tested	Number					
	Unit					
Temperature	Number					
	Unit					

Water Quality Indicator

Sample Number	Type *(e.g., fecal coliforms)*	Concentration *(number)*	Unit *(e.g., CFU)*

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				
	☐ yes				

* Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Rec Water-Untreated

Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Untreated Venues

	Factors *(check all that apply)**	Documented/ Observed**	Suspected**
	Out of compliance with bather load/density requirements	☐	☐
PEOPLE	Primary intended use of water is by diaper/toddler aged children (e.g., kiddie pool)	☐	☐
PEOPLE	Heavy use by child care center groups	☐	☐
PEOPLE	Fecal/vomitus accident	☐	☐
PEOPLE	Patrons continued to swim when ill or within 2 weeks of being ill	☐	☐
	Operator error	☐	☐
	Intentional contamination (explain in remarks)	☐	☐
SWIM AREA DESIGN	Hygiene facilities inadequate or distant (e.g., no toilets, no diaper changing facilities)	☐	☐
SWIM AREA DESIGN	Malfunctioning or inadequate onsite wastewater treatment system *** ≠	☐	☐
SWIM AREA DESIGN	Poor siting/design of onsite wastewater treatment system *** ≠	☐	☐
SWIM AREA DESIGN	Stagnant or poorly circulating water in swim area	☐	☐
	Heavy rainfall and runoff	☐	☐
	Sanitary sewer overflow (SSO) impact ***	☐	☐
	Combined sewer overflow (CSO) impact ***	☐	☐
	Domestic animal contamination (e.g., livestock, pets)	☐	☐
WATER QUALITY	Wildlife contamination - Birds	☐	☐
WATER QUALITY	Wildlife contamination - Mammals	☐	☐
WATER QUALITY	Wildlife contamination - Fish kill	☐	☐
WATER QUALITY	Wastewater treatment plant effluent flows past swim area	☐	☐
WATER QUALITY	Wastewater treatment plant malfunction ***	☐	☐
WATER QUALITY	Sewer line break ***	☐	☐
WATER QUALITY	Nearby biosolid/land application site (e.g., human or animal waste application)	☐	☐
	Contamination from agricultural chemical application (e.g., fertilizer, pesticides)	☐	☐
	Contamination from chemical pollution not related to agricultural application	☐	☐
	Water temperature ≥30°C (≥86°F)	☐	☐
	Seasonal variation in water quality (e.g., lake/reservoir turnover events)	☐	☐
	Inappropriate dumping of sewage into water body (e.g., boat, RV)	☐	☐
	Algal bloom	☐	☐
	Dumping of ballast water	☐	☐
	Tidal wash (i.e., tide exchange or influence by inland water)	☐	☐
POLICY AND MANAGEMENT	Aquatics operator has not received state/local certified training	☐	☐
POLICY AND MANAGEMENT	Untrained/inadequately trained staff on duty	☐	☐
POLICY AND MANAGEMENT	Unclear communication chain for reporting problems	☐	☐
POLICY AND MANAGEMENT	Employee illness policies absent	☐	☐
POLICY AND MANAGEMENT	No operator on duty at the time of incident	☐	☐
	Other, specify:	☐	☐
	Unknown	☐	☐

*** Only check off what was found during investigation**

**** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.**

***** The release of sewage does not have to occur on the property in which persons have become ill. The sewage release may have occurred at a distant site but still affected the property in question.**

≠ "Onsite wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g., septic systems or other advanced on site systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place due to migration of contaminants from malfunctioning systems or poor siting and design.

Remarks

Drinking Water Vehicle Description

Drinking Water Vehicle Description

Water Type* *(e.g., commercially-bottled water, community water system, individual water system)*	Public Water System EPA ID Number**	Water Source *(select ground water, surface water or unknown)*	Water Source Description *(e.g., spring; well; lake)*	Setting of Exposure *(e.g., airport, mobile home park)*	USUAL Water Treatment Provided *(e.g., no treatment, disinfection, home filtration)*	Water Treatment Subtype *(disinfection or filtration: e.g., boiling; chlorine; rapid sand filter; reverse osmosis)*

*Water system definitions: Community and noncommunity water systems are public water systems that have that have ≥ 15 service connections or serve an average of ≥ 25 residents for ≥ 60 days/year. A community water system serves year-round residents of a community, subdivision, or mobile home park. A noncommunity water system serves an institution, industry, camp, park, hotel, or business and can be nontransient or transient. Nontransient systems serve ≥ 25 of the same persons for > 6 months of the year but not year-round (e.g., factories and schools), whereas transient systems provide water to places in which persons do not remain for long periods (e.g., restaurants, highway rest stations, and parks). Individual water systems are small systems not owned or operated by a water utility that have < 15 connections or serve < 25 persons.

** Number used for EPA reporting that uniquely identifies the water system within a specific state. The water system ID number can be found at http://www.epa.gov/safewater/dwinfo/index.html by first selecting a state and then selecting a county.

Drinking Water Quality

Did the drinking water system have any monitoring violations in the 1 month prior to the outbreak?

☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **Yes**, explain: _____

Did the drinking water system have any maximum contaminant level (MCL) violations in the 1 month prior to the outbreak?

☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **Yes**, explain: _____

Did the drinking water system have any violations in the 12 months prior to the outbreak?***

☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **Yes**, explain: _____

***Sources of information about past violations can be obtained from utility records, consumer confidence reports (water quality reports), or violation records from state or local health departments

Laboratory Section - Drinking Water

Was drinking water tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample						
Additional Description of Source of Sample *(e.g., kitchen faucet, well, reservoir)*						
Date *(mm/dd/yyyy)*						
Volume Tested	Number					
	Unit					
Temperature	Number					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	Number					
	Unit					
pH						
Turbidity (NTU)						

Drinking Water

Water Quality Indicator

Sample Number	Type *(e.g., fecal coliforms)*	Concentration *(number)*	Unit *(e.g., CFU)*

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				

* Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Factors Contributing to Drinking Water Contamination and/or Increased Exposure to Contaminated Drinking Water

Did a problem with the source water (i.e., ground water or surface water) contribute to the disease or outbreak?

☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Source Water Factors *(check all that apply)***	Documented/ Observed***	Suspected***
Sanitary sewer overflow (SSO) ****	☐	☐
Combined sewer overflow (CSO) ****	☐	☐
Malfunctioning on-site wastewater treatment system **** ≠	☐	☐
Sewage treatment plant malfunction ***	☐	☐
Sewer line break ***	☐	☐
Poor siting/design of on site wastewater treatment system **** ≠	☐	☐
Nearby biosolid/land application site (e.g., human or animal waste application)	☐	☐
Contamination from agricultural chemical application (e.g., fertilizer, pesticides)	☐	☐
Contamination from chemical pollution not related to agricultural application	☐	☐
Contamination by a chemical that the current treatment methods were not designed to remove	☐	☐
Domestic animal contamination (e.g., livestock, concentrated feeding operations, pets)	☐	☐
Wildlife contamination - Birds	☐	☐
Wildlife contamination - Mammals	☐	☐
Wildlife contamination - Fish kill	☐	☐
Flooding/heavy rains	☐	☐
Algal bloom	☐	☐
Seasonal variation in water quality (e.g., lake/reservoir turnover events, resort community with seasonal loading)	☐	☐
Low water table (e.g., drought, over-pumping)	☐	☐
Ground water under direct influence of surface water (e.g., shallow well)≠ ≠	☐	☐
Contamination through limestone or fissured rock (e.g., karst)	☐	☐
Contaminated recharge water	☐	☐
Use of an alternate source of water by a water utility	☐	☐
Mixing of raw water from different sources	☐	☐
Improper construction or location of a well or spring	☐	☐
Water system intake failure (e.g., cracked well casing, cracked intake pipe)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown		

** Only check off what was found during investigation

*** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

**** The release of sewage does not have to occur on the property in which persons have become ill. The sewage release may have occurred at a distant site but still affected the property in question.

≠ "On site wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g., septic systems or other advanced on site systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place du to migration of contaminants from malfunctioning systems or poor siting and design.

≠ ≠ Any water beneath the surface of the ground with substantial occurrence of insects or other macroorganisms, algae, or large-diameter pathogens (e.g., *Giardia intestinalis* or *Cryptosporidium*), or substantial and relatively rapid shifts in water characteristics (e.g., turbidity, temperature, conductivity, or pH) that closely correlate with climatologic or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the state.

Drinking Water

Factors Contributing to Drinking Water Contamination and/or Increased Exposure to Contaminated Drinking Water

Did a problem with the water treatment prior to entry into a house or building contribute to the disease or outbreak?

☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Treatment Factors *(check all that apply)**	Documented/ Observed**	Suspected**
Change in treatment process	☐	☐
No disinfection	☐	☐
Temporary interruption of disinfection	☐	☐
Chronically inadequate disinfection	☐	☐
No filtration	☐	☐
Inadequate filtration	☐	☐
Deficiencies in other treatment processes	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Contamination during construction or repair of pipes/components	☐	☐
Construction or repair of pipes/components without evidence of contamination	☐	☐
Operator error	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

Did a problem with the distribution system contribute to the disease or outbreak? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

(NOTE: For a community water system, the distribution system refers to the pipes and storage infrastructure under the jurisdiction of the water utility prior to the water meter (or property line if the system is not metered). For noncommunity and nonpublic water systems, the distribution system refers to the pipes and storage infrastructure prior to entry into a building or house)

Distribution and Storage Factors *(check all that apply)**	Documented/ Observed**	Suspected**
Cross-connection of potable and nonpotable water pipes resulting in backflow	☐	☐
Low pressure or change in water pressure in the distribution system	☐	☐
Change in water flow direction in the distribution system	☐	☐
Mixing of treated water from different sources	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Contamination of mains during construction or repair	☐	☐
Construction or repair of mains without evidence of contamination	☐	☐
Scheduled flushing of the distribution system	☐	☐
Contamination of storage facility	☐	☐
Aging water distribution components (e.g., pipes, tanks, valves)	☐	☐
Water temperature ≥30°C (≥86°F)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

Did a problem occur after the water meter or outside the jurisdiction of a water utility that contributed to the disease or outbreak? (e.g., in a service line leading to a house/building, in the plumbing inside a house/building, during shipping/hauling, during storage other than in the distribution system, at the point of use, involving commercially-bottled water)

☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Factors Not Under the Jurisdiction of a Water Utility or Factors at the Point of Use *(check all that apply)**	Documented/ Observed**	Suspected**
Legionella species in water system	☐	☐
Cross-connection of potable and nonpotable water pipes resulting in backflow	☐	☐
Lack of backflow prevention in plumbing	☐	☐
Low pressure or change in water pressure in the plumbing	☐	☐
Change in water flow direction in the plumbing	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Aging plumbing components (e.g., pipes, tanks, valves)	☐	☐
Contamination of plumbing during construction or repair	☐	☐
Construction or repair of plumbing without evidence of contamination	☐	☐
Deficiency in building/home-specific water treatment after the water meter or property line	☐	☐
Deficiency or contamination of equipment/devices using or distributing water	☐	☐
Contamination during commercial bottling	☐	☐
Contamination during shipping, hauling, or storage	☐	☐
Contamination at point of use – Tap	☐	☐
Contamination at point of use – Hose	☐	☐
Contamination at point of use – Commercially-bottled water	☐	☐
Contamination at point of use – Container, bottle, or pitcher	☐	☐
Contamination at point of use – Unknown	☐	☐
Water temperature ≥30°C (≥86°F)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

*** Only check off what was found during investigation**

**** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.**

Drinking Water

Remarks

WNID/WUI

Water Not Intended for Drinking or Water of Unknown Intent (WNID/WUI)

Intent for Use

What was the intended use for the implicated water? *(check all that apply)*

☐ Cooling/Air Conditioning (e.g., cooling tower, swamp cooler)
☐ Mister (e.g., produce in grocery store, public cooling system)
☐ Ornamental (e.g., a decorative non-interactive fountain intended for public display and not designed for swimming or recreational use)
☐ Industrial/Occupational (e.g., steam cleaner)
☐ Agricultural Irrigation
☐ Waste water
☐ Other (specify):_____
☐ Unknown

Water Description

Water Type *(e.g., cooling tower; drainage ditch; fountain- ornamental)*	**Setting of Exposure** *(e.g., airport; hospital/health care facility, nursing home; park- state park)*	**USUAL Water Treatment Provided** *(e.g., no treatment; disinfection; settling/sedimentation)*	**Water Treatment Subtype** *(disinfection or filtration: e.g., boiling; chlorine; rapid sand filter; reverse osmosis)*

Laboratory Section

Was the implicated water tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample						
Additional Description of Source of Sample *(e.g., stream not intended for drinking, main A/C unit)*						
Date *(mm/dd/yyyy)*						
Volume Tested	**Number**					
	Unit					
Temperature	**Number**					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	**Number**					
	Unit					
Turbidity (NTU)						
pH						

Water Quality Indicator

Sample Number	**Type** *(e.g., fecal coliforms)*	**Concentration** *(number)*	**Unit** *(e.g., CFU)*

WNID/WUI

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				
	☐ yes				

*** Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay**

Factors Contributing to Contamination and/or Increased Exposure to Contaminated Water

Factors *(check all that apply)**	Documented/ Observed**	Suspected**
Cooling tower/evaporative condenser – shutdown for >3 days without draining to waste	☐	☐
Cooling tower/evaporative condenser – lack of a maintenance program	☐	☐
Cooling tower/evaporative condenser – lack of a qualified water quality specialist	☐	☐
Cooling tower/evaporative condenser – presence of scale or corrosion	☐	☐
Cooling tower/evaporative condenser – presence of dirt, organic matter, or other debris in the cold water basin	☐	☐
Cooling tower/evaporative condenser – absence of drift eliminators	☐	☐
Cooling tower/evaporative condenser – presence of damaged drift eliminators	☐	☐
Cooling tower/evaporative condenser – history of recent repairs to the device	☐	☐
Cooling tower/evaporative condenser – siting of device near building air intakes	☐	☐
Cooling tower/evaporative condenser – siting of device near windows that can be opened	☐	☐
Cooling tower/evaporative condenser – siting of device in immediate area of kitchen exhaust fans, live plants, truck bays, or other sources of organic matter	☐	☐
Cooling tower/evaporative condenser – construction on the premises of the device within 6 months before the index case	☐	☐
Cooling tower/evaporative condenser – construction within 100 meters of the premises of the device within 6 months before the index case	☐	☐
Ornamental fountain – presence of submerged lighting	☐	☐
Ornamental fountain – lack of a written cleaning and maintenance program	☐	☐
Ornamental fountain – presence of dirt, organic matter, or other debris in the water basin	☐	☐
Broken/damaged sewer pipe	☐	☐
Recycling of water	☐	☐
Water temperature ≥30°C (≥86°F)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

*** Only check off what was found during investigation**

**** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.**

Remarks

Epidemic and laboratory assistance for the investigation of a waterborne disease outbreak is available upon request by the State Health Department to the Centers for Disease Control and Prevention. Please enter this report into the National Outbreak Reporting System (NORS). State/Local investigation reports and questionnaires can also be attached to the report in the electronic system. Communications and requests for epidemic and laboratory assistance may be directed to: Waterborne Disease and Surveillance Coordinator. Division of Parasitic Diseases, National Center for Zoonotic, Vector-Borne, and Enteric Diseases, Coordinating Center for Infectious Diseases, CDC 4770 Buford Highway, NE, MS F-22, Atlanta, GA, 30341-3724 or (770) 488-7775

ADHS Outbreak Summary Report Form

Submit by Email | Print Form

OUTBREAK SUMMARY FORM

Arizona Department of Health Services

The following form should be completed for all reported outbreaks in Arizona.

BASIC INFORMATION

Outbreak Number:

Outbreak Name:

Outbreak Identified by:

1st Notification to LHD:

1st Notification to ADHS:

County of Exposure:

Investigation Started:

Investigation Closed:

Facility Name:

☐ Outbreak entered into NORS, if applicable

NORS ID:

☐ Source Identified? If yes:

CLINICAL & EPIDEMIOLOGICAL INFORMATION

Date first case became ill:

Date last case became ill:

Date of initial exposure:

Date of last exposure:

Primary Cases

# of Lab-confirmed cases:

# of probable cases:

estimated total primary ill:

Sex

Male (%)

Female (%)

Unknown (%)

Age Group (%)

<1 yr: 1-4 yrs: 5-9 yrs:

10-19 yrs: 20-49 yrs: 50-74 yrs:

>75 yrs: Unknown:

Incubation Period & Duration of illness for Primary Cases only

	Shortest (Hrs)	Median (Hrs)	Longest (Hrs)
Incubation Period:			
Duration of illness:			

☐ Unknown Incubation Period

☐ Unknown Duration of illness

Signs & Symptoms for Primary Cases only

☐ Vomiting ☐ Diarrhea ☐ Nausea ☐ Fever

☐ Cough ☐ Chills ☐ Rash ☐ HUS

☐ Bloody Stools ☐ Ab. cramps ☐ Asymptomatic

☐ Other

Severity

	Hospitalized	Visited ER	Visited Health care Provider (excl. ER)	Died
Number of Cases:				
Total # with info. :				

Misc.:

Setting of Exposure:

Mode of Transmission:

Attack Rate:

Investigation Methods (Check all that apply)

☐ Interviews with Cases Only ☐ Epidemiological Studies ☐ Facility/Establishment Investigation ☐ Traceback

☐ Environmental Health Assessment ☐ Case/Patient Samples ☐ Environmental Samples

LABORATORY INFORMATION

☐ Etiology known (check if yes)

Etiology: _____ Total # specimens collected: _____

If Etiology unknown:

Were patient specimens collected? ☐ Yes ☐ No ☐ Unknown

If Yes:

Total # specimens collected: _____

What were they tested for: _____

If No:

Presumptive Etiology: _____

ADDITIONAL REMARKS

_____

SUPPLEMENTAL INFORMATION (*optional*)

☐ Line List Received by LHD ☐ Written Report ☐ Line List created by LHD

☐ Education Materials Provided ☐ Epi Curve

Case Definitions:

Confirmed: _____

Probable: _____

Note: Please send a pdf copy of this form to ADHS and submit it through the "submit by email" button at the top of the form

Supplemental Questionnaire – Oregon Shotgun

This questionnaire is an adaptation of a questionnaire developed by Oregon Public Health Services, modified from the food exposure section of the 2006-2007 FoodNet Population Survey. It can be used as a template for foodborne outbreak investigations. Food exposure frequencies of outbreak cases can be readily compared to food exposure frequencies in the FoodNet population survey (available at http://www.cdc.gov/foodnet/studies_pages/pop.htm). The first page is not part of the FoodNet Population Survey but includes information that may be routinely gathered as part of an outbreak investigation.

Respondent was... ❒ self ❒ parent ❒ caretaker ❒ _____ Interviewed by _____ on _____

Age _____ Sex ❒ M ❒ F onset of first symptoms (m/d) ____/____ first vomiting or diarrhea (m/d) ____/____

	Y	?	N	LEAD-IN QUESTIONS [BLOCK 1]	
A	❒	❒	❒	Was anyone in your household sick with diarrhea or vomiting in the week before you got sick?	❒ not applicable
B	❒	❒	❒	Are you on any kind of special or limited diet? *If yes*, describe: _____	
C	❒	❒	❒	Did you spend any nights away from home in the XXX days before you got sick?	
D	❒	❒	❒	Did you have any contact with dogs, cats, or other pets in that period?	
E	❒	❒	❒	Did you handle any pet treats like pig ears, rawhide chews—at home or anywhere else?	
F	❒	❒	❒	Did you have any contact with reptiles, including snakes, iguanas or other lizards, and turtles?	
G	❒	❒	❒	Do you have any underlying medical conditions such as pregnancy, cancer, or diabetes that you have been told might affect your immune system? *If yes*, specify : _____	

First I'd like to ask about the kinds of places where you might have eaten food in the XXX days before you got sick. This may help you remember specific food items, which I'll ask you about in a minute. Did you eat anything at any....

	Y	?	N	EATING AND SHOPPING VENUES [BLOCK 2]
A	❒	❒	❒	fast-food restaurants (specify) _____
B	❒	❒	❒	sit-down restaurants(*if yes*, specify type(s) in box at right)
C	❒	❒	❒	grocery-store deli or other kind of deli _____
D	❒	❒	❒	bakery
E	❒	❒	❒	coffee shop (e.g., Starbucks)
F	❒	❒	❒	street vendor/push cart/kiosk?
G	❒	❒	❒	event concession stands (like at a sporting event or a concert)
H	❒	❒	❒	gas station or similar mini-mart
I	❒	❒	❒	tavern or bar
J	❒	❒	❒	free samples anywhere (e.g., grocery store, Costco, farmer's market)
K	❒	❒	❒	cafeteria/dining room (e.g., worksite, hospital, school)
L	❒	❒	❒	nursing home/ALC dining facility
M	❒	❒	❒	hotel room service
N	❒	❒	❒	child-care facility
O	❒	❒	❒	potluck-type private events
P	❒	❒	❒	catered private gatherings (e.g., weddings, parties)
Q	❒	❒	❒	any food at a church social or similar gathering or "coffee" hour
R	❒	❒	❒	food brought in to school classes, offices, or work place

	Y	?	N	RESTAURANT TYPES [3]
A	❒	❒	❒	Chinese
B	❒	❒	❒	Vietnamese
C	❒	❒	❒	Thai
D	❒	❒	❒	Japanese
E	❒	❒	❒	Indian/South Asian
F	❒	❒	❒	other Asian
G	❒	❒	❒	Mexican
H	❒	❒	❒	Italian
I	❒	❒	❒	Cuban/Caribbean
J	❒	❒	❒	Greek
K	❒	❒	❒	Other "international"
L	❒	❒	❒	vegetarian
M	❒	❒	❒	barb eque
N	❒	❒	❒	seafood
O	❒	❒	❒	breakfast place
P	❒	❒	❒	diner/neighborhood cafe
Q	❒	❒	❒	all-you-can-eat buffet
R	❒	❒	❒	other

Now I'd like to ask about where the food came from that you ate at home in those XXX days. In other words, this isn't necessarily where you shopped in those days, but where the food that you ate during that time came from. OK? Did any of it come from...

	Y	?	N	SOURCES OF FOOD AT HOME [4]		
A	❒	❒	❒	grocery stores/supermarkets (*specify*) _____	_____	_____
B	❒	❒	❒	food warehouse stores (Costco, Sams,etc.) _____	_____	_____
C	❒	❒	❒	mini-marts (e.g., 7-11, AM/PM)		
D	❒	❒	❒	ethnic specialty markets		
E	❒	❒	❒	delicatessens		
F	❒	❒	❒	bakeries		
G	❒	❒	❒	farmer's markets		
H	❒	❒	❒	fish or meat shops		
I	❒	❒	❒	home delivery services (e.g., Schwan's, Meals-on-Wheels)		
J	❒	❒	❒	home-grown produce		
K	❒	❒	❒	home-slaughtered meat		
L	❒	❒	❒	other private households (friends, family, etc)		
M	❒	❒	❒	other (specify)		

Food exposures (Section 1)

Now I'd like to ask you about a long list of food items, and for each one my question will be "Did you eat it in the past 7 days?" The lists are organized into categories, like eggs and dairy foods, vegetables and fruits, and so on. For each item, give me a "yes" or "no" if you remember eating or even tasting it in the past 7 days. Some of the questions might seem a little repetitive, but please try and answer each question individually, even if you think it was already covered. Unless I specify otherwise, I'm interested in whether you ate these items at home or away from home—either one, OK?

	Y	?	N	DAIRY AND EGGS
A	❒	❒	❒	eggs {anything anywhere from fresh eggs} *If yes, ...*
B	❒	❒	❒	any eggs at home
C	❒	❒	❒	any eggs away from home
D	❒	❒	❒	any eggs anywhere that were runny
E	❒	❒	❒	anything that had eggs that were still raw in it {e.g., dough, sauces, homemade ice cream, mayo}
F	❒	❒	❒	any egg substitutes {Egg-Beaters, etc.}
G	❒	❒	❒	butter {real butter; not margarine}
H	❒	❒	❒	buttermilk {fluid, not powdered}
I	❒	❒	❒	sour cream
J	❒	❒	❒	whipped cream
K	❒	❒	❒	fresh or flavored store-bought yogurt
L	❒	❒	❒	frozen yogurt
M	❒	❒	❒	ice cream
N	❒	❒	❒	ice cream bars or frozen dairy dessert items
O	❒	❒	❒	any pasteurized {"regular"} milk.
P	❒	❒	❒	any unpasteurized {raw} milk

	Y	?	N	MEAT & POULTRY
A	❒	❒	❒	any chicken prepared at home {i.e., not take-out}
B	❒	❒	❒	anything prepared at home from a "whole" chicken
C	❒	❒	❒	*if yes*, was that chicken *frozen* when you got it?
D	❒	❒	❒	anything prepared at home from pre-cut chicken parts
E	❒	❒	❒	*if yes*, was that chicken *frozen* when you got it?
F	❒	❒	❒	any chicken prepared or eaten *away* from home
G	❒	❒	❒	anything from ground chicken
H	❒	❒	❒	ground turkey
I	❒	❒	❒	any other turkey {whole or parts}
J	❒	❒	❒	duck or game hen
K	❒	❒	❒	pre-frozen hamburger patties eaten at home
L	❒	❒	❒	*if yes*, were any patties *pink on the inside* when eaten?
M	❒	❒	❒	fresh {not store-frozen} hamburger patties at home
N	❒	❒	❒	*if yes*, was it *pink on the inside* when eaten?
O	❒	❒	❒	anything else made with ground beef at home
P	❒	❒	❒	any other beef {steak, roasts, etc.} at home
Q	❒	❒	❒	veal
R	❒	❒	❒	pork
S	❒	❒	❒	ham
T	❒	❒	❒	lamb
U	❒	❒	❒	any kind of game {venison, pheasant, etc.— fresh, frozen, or dried}

	Y	?	N	CHEESE
A	❒	❒	❒	cream cheese
B	❒	❒	❒	cottage cheese
C	❒	❒	❒	Ricotta
D	❒	❒	❒	any "string" cheese
E	❒	❒	❒	any cheese sold as or cut from solid blocks {"typical"}
F	❒	❒	❒	any cheese on a deli-type sandwich
G	❒	❒	❒	any cheese spread
H	❒	❒	❒	American {processed) cheese
I	❒	❒	❒	cheddar
J	❒	❒	❒	Swiss
K	❒	❒	❒	uncooked mozzarella {e.g., *not* cooked on pizza}
L	❒	❒	❒	any Parmesan or Romano
M	❒	❒	❒	any blue-veined cheese {Bleu, gorgonzola,...}
N	❒	❒	❒	feta
O	❒	❒	❒	any cheese made from goat or sheep milk
P	❒	❒	❒	any fancy imported cheese
Q	❒	❒	❒	homemade Mexican-style {*queso fresco, q. blanco*}
R	❒	❒	❒	store-bought Mexican-style {*queso fresco, q. blanco*}
S	❒	❒	❒	any cheese made from unpasteurized milk {often homemade or sold off-the-farm or door-to-door}

	Y	?	N	COOKED OR PROCESSED MEATS
A	❒	❒	❒	smoked or dried fish {e.g., lox}
B	❒	❒	❒	any pre-packaged sliced deli meats
C	❒	❒	❒	any other sliced deli meats {i.e., *not* pre-packaged}
D	❒	❒	❒	corn dogs
E	❒	❒	❒	hot dogs
F	❒	❒	❒	bologna
G	❒	❒	❒	bacon
H	❒	❒	❒	breakfast sausage
I	❒	❒	❒	any other sausage/bratwurst etc.
J	❒	❒	❒	pepperoni/salami
K	❒	❒	❒	store-bought beef sticks/jerky
				---------- **SEAFOOD** ----------
A	❒	❒	❒	{store-bought} fresh fish
B	❒	❒	❒	crab
C	❒	❒	❒	shrimp/prawns
D	❒	❒	❒	oysters
E	❒	❒	❒	*if yes,* were the oysters raw when eaten?
F	❒	❒	❒	other shellfish
G	❒	❒	❒	*if yes*, were the shellfish *raw* when eaten?
H	❒	❒	❒	sushi, sashimi, or ceviche made with raw fish or shellfish

	Y	?	N	FRESH VEGETABLES {Not frozen}
A	❐	❐	❐	celery
B	❐	❐	❐	mini-carrots in sealed bag
C	❐	❐	❐	loose or bagged carrots {full size}
D	❐	❐	❐	cucumbers
E	❐	❐	❐	broccoli
F	❐	❐	❐	cauliflower
G	❐	❐	❐	green bell peppers
H	❐	❐	❐	red bell peppers
I	❐	❐	❐	asparagus
J	❐	❐	❐	fresh corn
K	❐	❐	❐	snow peas {eaten in pod}
L	❐	❐	❐	fresh beans
M	❐	❐	❐	brussel sprouts
N	❐	❐	❐	eggplant
O	❐	❐	❐	zucchini or other "soft" squash
P	❐	❐	❐	any "hard" squash {pumpkin, acorn, etc.}
Q	❐	❐	❐	white or yellow onions
R	❐	❐	❐	green onions {scallions}
S	❐	❐	❐	leeks
T	❐	❐	❐	avocado {or guacamole}
U	❐	❐	❐	any homegrown fresh tomatoes {eaten raw}
V	❐	❐	❐	any store-bought fresh tomatoes eaten at home {raw}

	Y	?	N	FRESH VEGETABLES {Not frozen}
A	❐	❐	❐	cabbage
B	❐	❐	❐	potatoes
C	❐	❐	❐	yams or sweet potatoes
D	❐	❐	❐	alfalfa sprouts
E	❐	❐	❐	bean sprouts
F	❐	❐	❐	any other sprouts {clover, mixed, broccoli, etc}
G	❐	❐	❐	any salad mix that came in a sealed bag
H	❐	❐	❐	mesclun lettuce {"spring mix"}
I	❐	❐	❐	any other iceberg lettuce
J	❐	❐	❐	any romaine lettuce
K	❐	❐	❐	any other leaf lettuce
L	❐	❐	❐	any lettuce on sandwiches or burgers
M	❐	❐	❐	any tomatoes on sandwiches or burgers
N	❐	❐	❐	fresh spinach {not frozen}
O	❐	❐	❐	other greens {collard, mustard, etc}
P	❐	❐	❐	fresh basil
Q	❐	❐	❐	fresh parsley
R	❐	❐	❐	fresh cilantro
S	❐	❐	❐	other fresh herbs
T	❐	❐	❐	fresh garlic
U	❐	❐	❐	fresh mushrooms
V	❐	❐	❐	beets, turnips, or radishes
W	❐	❐	❐	any "organic" produce

	Y	?	N	FRESH FRUIT *{Not frozen or cooked}*
A	❐	❐	❐	apples
B	❐	❐	❐	pears
C	❐	❐	❐	peaches
D	❐	❐	❐	nectarines
E	❐	❐	❐	apricots
F	❐	❐	❐	oranges
G	❐	❐	❐	tangerines
H	❐	❐	❐	grapefruit
I	❐	❐	❐	lemon
J	❐	❐	❐	lime
K	❐	❐	❐	strawberries
L	❐	❐	❐	raspberries
M	❐	❐	❐	blueberries
N	❐	❐	❐	blackberries

	Y	?	N	FRESH FRUIT *{Not frozen or cooked}*
A	❐	❐	❐	cherries
B	❐	❐	❐	plums
C	❐	❐	❐	any kind of grapes *if yes…*
D	❐	❐	❐	green grapes
E	❐	❐	❐	red grapes
F	❐	❐	❐	bananas
G	❐	❐	❐	plantains
H	❐	❐	❐	cantaloupe
I	❐	❐	❐	honeydew
J	❐	❐	❐	watermelon
K	❐	❐	❐	kiwi
L	❐	❐	❐	pineapple
M	❐	❐	❐	mango
N	❐	❐	❐	papaya

	Y	?	N	PREMADE AND DRIED FOODS
A	❒	❒	❒	store-bought fruit salad
B	❒	❒	❒	store-bought pasta salad
C	❒	❒	❒	store-bought potato salad
D	❒	❒	❒	store-bought egg salad
E	❒	❒	❒	store-bought cole slaw
F	❒	❒	❒	peanuts {loose or in shell}
G	❒	❒	❒	peanut butter
H	❒	❒	❒	any fresh-ground "natural" peanut butter
I	❒	❒	❒	almonds
J	❒	❒	❒	walnuts
K	❒	❒	❒	cashews
L	❒	❒	❒	pistachios
M	❒	❒	❒	sunflower seeds
N	❒	❒	❒	raisins
O	❒	❒	❒	any pre-made pudding or custard {not a mix}

	Y	?	N	MISCELLANY
A	❒	❒	❒	chips {potato, corn, Fritos, etc}
B	❒	❒	❒	any *fresh* salsa
C	❒	❒	❒	taco shells
D	❒	❒	❒	tortillas
E	❒	❒	❒	bulk chocolate {not wrapped candy}
F	❒	❒	❒	any apple juice/cider
G	❒	❒	❒	any apple juice/cider that is freshly pressed and not pasteurized
H	❒	❒	❒	any orange juice
I	❒	❒	❒	any fresh squeezed orange juice that {not from a carton or concentrate}
J	❒	❒	❒	any juice that is not pasteurized and not from a concentrate {often bought from farms or orchards, but may be sold commerically with a label saying it is unpasteurized and may contain bacteria}
K	❒	❒	❒	tofu
L	❒	❒	❒	baby formula bought as a liquid in a can
M	❒	❒	❒	baby formula bought as a powder
N	❒	❒	❒	store-bought puréed baby food {e.g., Gerbers}
O	❒	❒	❒	commercially bottled water
P	❒	❒	❒	cold breakfast cereals {e.g., Cheerios, Raisin Bran}
Q	❒	❒	❒	granola
R	❒	❒	❒	hot breakfast cereals {oatmeal, etc.}

	Y	?	N	FROZEN FOODS
A	❒	❒	❒	frozen dinners/entrees
B	❒	❒	❒	frozen vegetables in a box
C	❒	❒	❒	frozen vegetables in a bag
D	❒	❒	❒	frozen berries
E	❒	❒	❒	frozen vegetarian stuff {e.g., Gardenburgers}
F	❒	❒	❒	frozen fish products
G	❒	❒	❒	frozen chicken strips or nuggets {at home}
H	❒	❒	❒	any other frozen chicken products
I	❒	❒	❒	frozen pizza
J	❒	❒	❒	frozen Mexican-style items
K	❒	❒	❒	frozen shrimp, frog legs, lobster, crab, other seafood

	Y	?	N	SPECIFIC FOODS EATEN OUT *These refer to food eaten or prepared away from home*
A	❒	❒	❒	Any burgers or ground beef at a fast-food place
B	❒	❒	❒	any other burger/ground beef away from home
C	❒	❒	❒	any other beef away from home
D	❒	❒	❒	any deli-type sandwich
E	❒	❒	❒	any sandwich with sprouts on it
F	❒	❒	❒	any sandwich or burger garnished with lettuce
G	❒	❒	❒	any sandwich or burger garnished with tomato
H	❒	❒	❒	anything from a salad bar
I	❒	❒	❒	any kind of salad made with lettuce or greens
J	❒	❒	❒	anything with raw tomatoes
K	❒	❒	❒	pizza from a pizzeria {not frozen}
L	❒	❒	❒	any kind of burrito or "wrap"

Animal Contact (Section 4)

IN THE PAST 7 DAYS did {you/your child} have any contact with any of the following?

	Y	?	N	R	
A	❒	❒	❒	❒	Bird
B	❒	❒	❒	❒	Kitten
C	❒	❒	❒	❒	Cat
D	❒	❒	❒	❒	Chicken
E	❒	❒	❒	❒	Baby chicks
F	❒	❒	❒	❒	Cow/bull/steer
G	❒	❒	❒	❒	Calf
H	❒	❒	❒	❒	Puppy {<6 months old}
I	❒	❒	❒	❒	Dog
J	❒	❒	❒	❒	Goat, Sheep, or Lamb
K	❒	❒	❒	❒	Horse
L	❒	❒	❒	❒	Pig
M	❒	❒	❒	❒	Reptile {including snakes, iguanas or other lizards, and turtles}
N	❒	❒	❒	❒	Amphibian {such as frogs}
O	❒	❒	❒	❒	Turkey
P	❒	❒	❒	❒	Tropical fish

	Y	?	N	R	
A	❒	❒	❒	❒	IN THE PAST 7 DAYS did {you/your child} handle any dog treats like pig ears, rawhide chews – at home or anywhere else?
B	❒	❒	❒	❒	IN THE PAST 7 DAYS did {you/your child} visit a petting zoo or farm?
C	❒	❒	❒	❒	IN THE PAST 7 DAYS did {you/your child} visit a state, county or local fair at which there were animals?
D	❒	❒	❒	❒	IN THE PAST 7 DAYS did {you/your child} visit any other events at which there were animals present such as festivals, animal shows, exhibits, swap meets, sales, etc.?

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Tips for Conducting Open-Ended Interviews

These are tips for open-ended interviewing from CDC but many of the tips are useful for any type of interviewing process:

Prior to Interview:
- Think about holidays and things that were in the news around the times the patient may have been exposed
- Have a blank calendar and identify the onset date and 7 day exposure period
- Let the patient know that a typical open-ended interview may last between an hour and 1.5 hours and then set up a time for the interview when they most likely have that amount of time available
- Ideally try to arrange to do the interview in the patient's home
- Familiarize yourself will the different categories of human and pet foods sold at typical supermarkets

During the Interview:
General considerations:
- Have your calendar and comprehensive list of food and other exposures in front of you (you can use the Oregon Shotgun Questionnaire or Minnesota Hypothesis Generating Questionnaire to assist with this)
- Open-ended questionnaires can last between 1 and 2 hours. At the start of the interview, let the interviewee know that if they begin to tire and are running short on time they should let you know. You can complete the interview at another time
- If you sense the patient is getting frustrated or distracted ask them if it would be better to complete the interview at another time
- Most helpful to have one person conduct all interviews without taking detailed notes and another person present to take the detailed notes
- If the note taker has any questions, ask that they refrain from asking until the end of the interview
- If another person is not available, consider bringing a voice recorder. Do not take notes, but rather, review recording after the interview. Make certain that the voice recorder is working and make sure patient if OK with being recorded
- Jot a few notes on your calendar of events mentioned by the patient to go back to and ask more about
- Talk as long as possible! The more patients talk the more time they have to recall things

Set the timeline:
- Ask interviewee to retrieve a calendar or date book they were actively using during their exposure period
- If it is a child the parent may have a school lunch calendar
- Put the exposure period in context by reminding them of notable news events or community events (e.g., holidays, festivals, fairs) that took place during their incubation period
- Ask them if they remember any personal notable events that took place during their incubation period (e.g., family member's/friend's birthday, anniversary, vacations, trips, car trouble, memorable meals outside of home). Jot anything down they mention on your calendar

Taking a complete food history:

- Ask questions that will elicit free-form responses; try not to ask yes/no questions, except for the purpose of clarification
- Don't start off with "What did you eat on 1 day before illness, 2 days, 3 days….7 days", but aim to eventually gather all of that information during the interview
- Walk them through a typical day from breakfast, lunch, dinner, snacks
- If interviewee doesn't remember try to prompt them with typical drinks, foods, associated with a meal
- Ask the patient to consider all of the categories of foods and other exposures you have in front of you. (Some frequently forgotten categories include: snack foods, frozen foods, microwavable foods, powdered drinks, condiments, add-ins, spices, garnishes)
- Occasionally stop the free flowing conversation in order to clarify things such as brand names of the food items mentioned, purchase locations, etc.
- Ask about special food diets or preferences
- Ask about absolute negatives (e.g., never eat dairy, never eat meat)
- Ask about favorite foods that might have been eaten during the incubation period
- Ask them about what foods are in their refrigerators and pantries now
    - For each item mentioned, ask them if that is the brand they typically eat
- Ask about how they prepare the foods they reported eating (or typically eat) (e.g., how they cook eggs, meat, etc)
- Ask patient to look at credit card statements to remind them of meals they may have had out of the home
- Use a list of common foods from the Oregon Shotgun Questionnaire or long foodborne history forms as a prompt in case interviewee or interviewer needs one
- Bring a list of suspect food items gathered from other open-ended interviews in the cluster and be sure to specifically ask about these items at the end of the interview, if they did not come up spontaneously
- Ask about mail-order foods and animal contacts

Questions to consider regarding source of food items:

- Did you go out of town during the 7 days before illness? Where?
- Where do you shop usually? Did you shop there during the 7 days before illness?
- Do you go outside of town to shop? What do you buy?
- Do you remember going to another city to shop during this time period?
- Do you shop at convenience stores? Do you buy food there?
- Do you order foods from the internet?
- Do you buy foods form farmers markets or roadside stands?
- Did you visit a friend's home? Did you eat there?
- Did you go to any other events or meetings? Did you eat there?
- Do you get food from anywhere else? Meals on wheels? Senior center? Food pantry?

Work exposures:

- Where do you work?
- Do you work in a hospital? Restaurant? Grocery store? Convenience store? Around animals?
- Do you do any volunteer work?
    - Do you handle or prepare food during the volunteer work? (Describe) Do you have contact with animals during the volunteer work?

Animal exposures:

- Do you have pets?
    - if dogs, what age? Adults or puppies?

  - What type of food? Dry dog food or wet dog food? Brand?
  - Treats? (pig ears, rawhide, animal bones, etc.) What are the treats made of?
  - Raw dog food?
  - Who feeds the dog?
  - Where is the dog food kept?
  - Do you feed the dog while eating?
  - Do you feed the dog during food preparation? Do you mix in any food items?
  - Has the dog been ill? In the 4 weeks before your illness?
- Any other exposures to animals of any kind at a friend's home, school or work?

End of interview:
- At the end ask if it is OK to call back if necessary
- Give them your phone number in case they think of other exposures

After Interview:
- For the second patient interviewed be sure to bring up any suspect exposures you discovered in the interview with the first patient
- After 2 open-ended interviews have been completed make a list of foods in common, ideally with as much brand detail as possible
- For the third interview be sure to ask about these suspect exposures
- Continue this process for each subsequent interview
- Call back initial patients about exposures that now have been mentioned by a couple of other patients
- If after individual open-ended questionnaire nothing comes up, consider inviting all cases together to discuss since group discussion may trigger memory

APPENDIX D

SUPPLEMENTAL DOCUMENTS FOR LABORATORY ANALYSIS

ADHS Microbiology Lab Submission Form

Arizona Department of Health Services

BUREAU OF STATE LABORATORY SERVICES
250 N. 17th Avenue
Phoenix, Arizona 85007-3231
Phone: 602-542-1188 Fax: 602-364-0758
Victor Waddell, Ph.D. Bureau Chief

For Department Use Only

Patient Information

Last Name: First Name: MI:
DOB (MM/DD/YYYY): Age: Sex: M F T
Patient ID:
Race: Ethnicity:
☐ African American ☐ Asian ☐ Other ☐ Hispanic ☐ Yes
☐ American Indian ☐ White ☐ No

Submitting Agency Information

Agency Name: Agency ID Code:
Street Address:
City: State: Code: County:
Contact Name: Phone:

Specimen Information and Type

Collection Date: _____
☐ Reference
☐ Clinical

☐ Serum Acute
☐ Serum Convalescent
☐ Serum Random
☐ Plasma
☐ Whole Blood
☐ CSF
☐ Urine

☐ Sputum
☐ Stool
☐ Swab
Site: _____
☐ Tissue
Specify: _____

☐ Wound
Site: _____
☐ Body Fluid
Specify: _____
☐ Other
Specify: _____

Reason for Testing ☐ Outbreak ☐ Surveillance ☐ Post mortem

Virology
☐ CMV Culture
☐ Enterovirus Culture
☐ Herpes Culture
☐ Influenza Culture
☐ Norovirus PCR
☐ Reference Virus Culture
☐ Respiratory Virus Culture
☐ Other: _____

Parasitology
☐ Arthropod ID
☐ Blood/Tissue
☐ Intestinal
☐ Pinworm
☐ Worm ID

Mycobacteriology
☐ Culture
☐ ID (Referred Culture)
☐ Smear
☐ Susceptibility
☐ *Nucleic Acid Amplification

Microbiology
☐ *Anthrax
☐ *Botulism toxin
☐ *Brucella
☐ *Diphtheria
☐ Chlamydia
☐ Enteric Culture
☐ E. coli/shigatoxin
☐ Haemophilus
☐ Legionella
☐ Leptospira
☐ Listeria
☐ Meningococcus
☐ Pertussis
☐ Salmonella
☐ Shigella
☐ *Tularemia
☐ Yersinia
☐ *pestis
☐ Other
☐ Vibrio
☐ cholerae
☐ Other
☐ Other: _____

Serology
☐ *Brucella Tube Agglutination
☐ Coccidioides Serology Panel
IDTP
IDCF
☐ Western Equine Encephalitis
☐ St. Louis Encephalitis
☐ Dengue IgG EIA
☐ *Hantavirus IgG EIA
☐ *Hantavirus IgM EIA
☐ Hepatitis Anti-HAV IgM
☐ Hepatitis Anti-Core IgM
☐ Hepatitis Anti-HCV
☐ Hepatitis HBsAG
☐ Prenatal Hepatitis HBsAG
☐ Diagnostic Hepatitis Panel
HBs Ag
HBc IgM
HAV IgM

☐ *Lyme EIA
☐ *Measles IgM IFA
☐ Mumps IgM FIA
☐ *Plague PHA
☐ Rickettsial Panel
Rickettsial Spotted Fever Group
Rickettsial Typhus Fever Group
Rickettsial Q Fever
☐ *Rubella IgM EIA
☐ Syphilis CSF VDRL
☐ Syphilis TP-PA
☐ Syphilis Serum RPR
☐ *Tularemia TA
☐ West Nile Virus EIA
☐ Other _____

***Prior notification required for:**
Anthrax, Botulism, Brucella, Diphtheria, emerging or exotic diseases, Hantavirus, Lyme, Measles, Mycobacteria NAA, Plague, Rubella, or Tularemia testing. **Call 602-364-3676.**

Submitting Lab
Findings or Preliminary ID:

All fields highlighted with yellow are required for specimen processing. In addition, at least one test must be requested.

ORIGINAL TO STATE LABORATORY AND BACK COPY TO SUBMITTER

http://www.azdhs.gov/lab/micro/submissionform3.pdf

ADHS Bacterial Food Analysis Submittal/Report Form

SUBMITTER SUBSAMPLE NUMBER

ARIZONA STATE LABORATORY

BACTERIAL FOOD ANALYSIS

SUBMITTAL/REPORT FORM

LAB NUMBER & DATE RECEIVED

PLEASE USE ONE FORM FOR EACH SAMPLE SUBMITTED

REPORT RESULTS TO:		Purpose of specimen:	COLLECTION OF SAMPLE
AGENCY (OR CODE)		☐ Quality Control	ESTABLISHMENT OF COLLECTION / CITY
ADDRESS		☐ Outbreak	ADDRESS OF COLLECTION
CITY / STATE /ZIP		☐ Number III _____	PERSON COLLECTING / PHONE NO.
CONTACT PERSON	PHONE NO. / FAX NO.		DATE / TIME

ANALYSIS REQUESTED

☐ Aerobic Plate Count	☐ E. coli. 0157:H7	☐ Salmonella	☐ Filth or Foreign Objects
☐ Total Coliform	☐ Staphylococcus	☐ Yeast and Mold	
☒ Fecal Coliform	☒ Bacillus cereus	☐ Container Analysis	☐ Other
☐ E. coli	☒ Clostridium perfringens		

Type of product: _____ Size _____

Processor / Manufacturer _____ Lot / Code No. _____

NAME OF PERSONS ILL	ADDRESS	SEX	AGE	TIME FACTORS: ATE Date / Time		ONSET Date / Time		INCUBATION PERIOD	Nausea	SYMPTOMS: Vomiting	Abdominal Cramps	Diarrhea	Fever	Headache	Other	Doctor Consulted	Hospitalized	Duration of Illness	Clinical Specimens Collected

LABORATORY REPORT - PLEASE DO NOT WRITE BELOW THIS LINE

Date and time processing began: _____

Physical Characteristics: _____

☐ Total Aerobic Plate Count: _____ /g

☐ Total Coliform (MPN): _____ /g

☐ Fecal Coliform (MPN): _____ /g

☐ E.coli (MPN): _____ /g

☐ Filth or Foreign Objects ☐ Container Analysis ☐ Other _____

☐ E. coli.0157:H7: _____

☐ Staphylococcus aureus: _____ /g

☐ Bacillus cereus: _____ /g

☐ Clostridium perfringens: _____ /g

☐ Yeast and mold: _____ /g

☐ Salmonella: _____

COMMENTS: _____

DATE REPORTED _____

ANALYST _____

Wesley B. Press, M.S., Bureau Chief

SLS-001 Rev. 7/03

http://www.azdhs.gov/lab/micro/envfood.htm

Examples of Clinical Specimen Collection Information Sheets

(Adapted from Maricopa County Department of Public Health)

Specimen Kit Assembly Instructions

I. Norovirus ONLY

When you begin, you should print out bag labels and the name and DOB of persons receiving the kit (if available).

1. Start with a collection container or 'hat'.
2. Into the hat place 1 pair of nitrile gloves
3. Into the hat place 1 plastic spoon.
4. Take one plastic biohazard bag and into this bag place one absorbent sheet. On top of the absorbent sheet place one specimen cup. (NOTE: If possible, label the cup with the recipient's name and DOB.) Seal the bag and remove as much air as possible.
5. Place the bagged specimen cup in the hat.
6. Get a copy of the norovirus only collection instructions, handwashing instruction, and norovirus fact sheet. Fold these in half and place on top of the items already in the hat.
7. Take a plastic grocery bag, and place all items in the bag.
8. Take a large brown paper bag, affix label to bag
9. Place bagged specimen collection gear into large paper bag
10. Get one small box, fold tabs together on one end.
11. Place transport label on box, and place in top of paper bag
12. Affix bag label to bag with stapler

II. Norovirus and Bacterial

When you begin, you should print out bag labels and the name and DOB of persons receiving the kit (if available).

1. Start with a collection container or 'hat'.
2. Into the hat place 1 pair of nitrile gloves
3. Into the hat place 1 plastic spoon.
4. Take one plastic biohazard bag and into this bag place one absorbent sheet. On top of the absorbent sheet place one specimen cup. (NOTE: If possible, label the cup with the recipient's name and DOB.) Seal the bag and remove as much air as possible.
5. Place the bagged specimen cup in the hat.
6. Take a second plastic biohazard bag and into this bag place one absorbent sheet. On top of the absorbent sheet place one paper packet of sterile swabs and one tube of Cary-Blair transport media. (NOTE: If possible, label the tube with the recipient's name and DOB.) Seal the bag and remove as much air as possible.
7. Get a copy of the norovirus and bacterial collection instructions, handwashing instruction, and specimen kit picture sheet. Fold these in half and place on top of the items already in the hat.
8. Take a plastic grocery bag, and place all items in the bag.
9. Take a large brown paper bag, affix label to bag
10. Place bagged specimen collection gear into large paper bag
11. Get one small box, fold tabs together on one end.
12. Place transport label on box, and place in top of paper bag
13. Affix bag label to bag with stapler

Example Specimen Collection Instructions for Suspect Bacterial and Norovirus Infections:

Please read all instructions before beginning.
Please note: **All specimens must be refrigerated immediately**.

Instructions for Stool Specimen Collection

1 Remove the specimen cup from the plastic bag leaving the yellow sheet in the bag.
2 **Label the cup with your Name (first & last), Date of Birth and Today's Date**. Set aside for now.
3 Remove the tube from the plastic bag leaving the yellow sheet in the bag.
4 **Label the tube with your Name (first & last), Date of Birth and Today's Date**. Set aside for now.
5 If possible, urinate ("pee") before collecting the stool specimen to avoid contaminating the specimen. (Stool is another word for "poop" or feces.)
6 Place the big white container (looks like a hat) in the toiled under the seat at the rear of the bowl. Defecate ("poop") into the container. (Don't let urine, toilet paper, water, or soap go into the hat.)
7 When you are done, take the "hat" and place on a stable surface.
8 Put on the gloves and remove a swab from the paper wrapper using gloved hands being careful not to touch the cotton tip. (There are two swabs in the paper package, only one is needed. If you drop one swab then the other can be used.)
9 Swab stool with cotton tip of swab.
10 Open the tube containing media (clear jelly) and put the swab, cotton tip first, into the tube. Make sure to put the swab all the way into the tube.
11 Screw cap tightly onto tube.
12 Place the tube back into the bag and close the bag.
13 Place the bag into one of the boxes provided and **refrigerate it immediately**. The box can be secured by either folding the flaps under or by taping it closed.
14 Using the plastic spoon transfer the remaining stool in the hat to the specimen cup and tightly close the specimen cup cap.
15 Place the specimen cup back into the bag and close the bag.
16 Place the bag into the second box provided and **refrigerate it immediately**. The box can be secured by either folding the flaps under or by taping it closed. Please do not put the tube and the cup into the same box.
17 Notify your public health contact that the specimen is ready for pick up. Your contact is:

Name: Phone Number

Please leave a message and you will be contacted to arrange a pickup time on the following business day. Thank you so much!

IMPORTANT: Please remember to wash your hands after handling your stool specimen and wash your hands frequently during and following your illness. Hand washing helps prevent the spread of disease.

NOTE: We are collecting this specimen as part of an outbreak investigation; it is NOT intended to be used for diagnosis and/or treatment of your condition. If you are still experiencing symptoms, you should consult with your medical provider.

Example Specimen Collection Instructions for Suspect Bacterial Infections:

Please read all instructions before beginning.
Please note: **All specimens must be refrigerated immediately**.

Instructions for Stool Specimen Collection

1 Remove the tube from the plastic bag leaving the yellow sheet in the bag.
2 **Label the tube with your Name (first & last), Date of Birth and Today's Date**. Set aside for now.
3 If possible, urinate ("pee") before collecting the stool specimen to avoid contaminating the specimen. (Stool is another word for "poop" or feces.)
4 Place the big white container (looks like a hat) in the toiled under the seat at the rear of the bowl. Defecate ("poop") into the container. (Don't let urine, toilet paper, water, or soap go into the hat.)
5 When you are done, take the "hat" and place on a stable surface.
6 Put on the gloves and remove a swab from the paper wrapper using gloved hands being careful not to touch the cotton tip. (There are two swabs in the paper package, only one is needed. If you drop one swab then the other can be used.)
7 Swab stool with cotton tip of swab.
8 Open the tube containing media (clear jelly) and put the swab, cotton tip first, into the tube. Make sure to put the swab all the way into the tube.
9 Screw cap tightly onto tube.
10 Place the tube back into the bag and close the bag.
11 Place the bag into one of the boxes provided and **refrigerate it immediately**. The box can be secured by either folding the flaps under or by taping it closed.
12 Notify your public health contact that the specimen is ready for pick up.

Your contact is:

Name: Phone Number

Please leave a message and you will be contacted to arrange a pickup time on the following business day. Thank you so much!

IMPORTANT: Please remember to wash your hands after handling your stool specimen and wash your hands frequently during and following your illness. Hand washing helps prevent the spread of disease.

NOTE: We are collecting this specimen as part of an outbreak investigation; it is NOT intended to be used for diagnosis and/or treatment of your condition. If you are still experiencing symptoms, you should consult with your medical provider.

Example Specimen Collection Instructions for Suspect Norovirus Infections:

Please read all instructions before beginning.
All specimens must be refrigerated immediately after collection.

Instructions for Stool Specimen Collection

1 If possible, urinate ("pee") before collecting the stool specimen to avoid contaminating the sample. (Stool is another word for "poop" or feces.)
2 Place the white plastic container (looks like a hat) in the toilet, under the seat, toward the rear of the bowl.
Defecate into the white plastic container. (Avoid mixing the stool sample collected with urine, toilet paper, water or soap with the sample.)
4 Using a clean disposable plastic spoon, transfer the stool to the specimen cup and tightly close the specimen cup.
5 **Label the cup with your Name (first & last), Date of Birth and the Collection Date**. Place the cup in the plastic Ziploc bag provided. This bag will also contain a sheet of yellow absorbent material. Please do not remove the yellow sheet.
6 Place the bagged specimen cup into the box provided and refrigerate it immediately. The box can be secured by either folding the flaps under or by securing with tape.
7 Please label the outside of the box with your name and date of birth.
8 Notify your public health contact that the specimen is ready for pick up.
Your contact is:

Name: Phone Number

Please leave a message and you will be contacted to arrange a pickup time on the following business day. Thank you so much!

IMPORTANT: Please remember to wash your hands after handling your stool specimen and wash your hands frequently during and following your illness. Hand washing helps prevent the spread of disease.

NOTE: We are collecting this specimen as part of an outbreak investigation; it is NOT intended to be used for diagnosis and/or treatment of your condition. If you are still experiencing symptoms, you should consult with your medical provider.

Example Specimen Collection Instructions for Suspect Parasitic Infections:

Please read all instructions before beginning.

Instructions for Stool Specimen Collection

1 Remove both little glass jars of liquid from the plastic bag. Leave the yellow cloth in the bag.

2 Label both jars with your Name (first & last), Date of Birth and the Today's Date. Set aside for now.

3 If possible, urinate ("pee") before collecting the stool specimen. (Stool is another word for "poop" or feces.)

4 Place the big white container (looks like a hat) in the toiled under the seat at the rear of the bowl. Defecate ("poop") into the container. (Don't let urine, toilet paper, water, or soap go into the hat.)

5 When you are done, take the "hat" and place on a stable surface.

6 Put on the gloves and using the plastic spoon, scoop up one level spoonful of stool. **Don't use more than one spoonful or it overflows and makes a mess.**

7 Open one jar containing clear liquid and put the spoonful of stool into the liquid. **Please be careful not to spill any of the liquid. The liquid is toxic if eaten.** If you do spill, please dispose of liquid by soaking with paper towels and placing them in trash. **Do not put the liquid down the drain.**

8 Close the lid tightly and shake gently so the stool mixes with the liquid.

9 Scoop another spoonful of stool and place it in the second jar so that stool is placed in **both** jars.

10 Put **both** jars back into the plastic bag. Leave the yellow sheet in there.

11 Place the bag into the box provided. The box can be secured by either folding the flaps under or by taping it closed.

12 Specimens can be stored at room temperature. It is not necessary to refrigerate specimens. **Do not store specimens in freezer.**

13 Carefully remove the gloves and dispose of them in the garbage where people and animals can not reach them. Wash your hands thoroughly.

14 Call us when you are ready to have the specimen picked up:

Name : Phone Number

Please leave a message and you will be contacted to arrange a pickup time on the following business day. Thank you so much!

IMPORTANT: Please remember to wash your hands after handling your stool specimen and wash your hands frequently during and following your illness. Hand washing helps prevent the spread of disease.

NOTE: We are collecting this specimen as part of an outbreak investigation; it is NOT intended to be used for diagnosis and/or treatment of your condition. If you are still experiencing symptoms, you should consult with your medical provider.

Specimen Kit

This is the specimen kit

This is the 'hat'. It is inserted in the toilet to collect the stool specimen.

This is the swab and media (clear jelly) in its bag. The swab is in the paper packet. The swab is removed from the packet, and the stool is swabbed while in the hat. The swab is then inserted in the media tube and tightly closed.

This is the specimen cup in its bag. This cup is used to collect the rest of the stool. The spoon is provided in the kit.

If you have any questions on how to properly collect the specimen, please contact "Name" at "Phone Number".

APPENDIX E

SUPPLEMENTAL DOCUMENTS FOR THE ENVIRONMENTAL ASSESSMENT

Foodborne Disease Outbreak Checklist for Food Inspectors

The following checklist provides general steps that food inspectors or administrators should take during a foodborne disease outbreak investigation.

- ☐ Confirm that a foodborne disease outbreak has occurred. Does it meet the definition for a foodborne disease outbreak?
    - **Multiple foodborne illness complaints** – If there are two or more foodborne illness complaints from the same facility within a 14-day time period
      OR
    - **Two or more individuals became ill after consuming food from a common source AND they reside in at least two households**

- ☐ Call the complainant to collect preliminary information on illness, number ill, number of households involved, total number that attended the event or meal, and other common activities, meals, or drinks shared.

- ☐ Contact and coordinate with supervisor and LHD Outbreak Epidemiologist for all outbreaks **prior** to the inspection.
    - Contact ADHS Environmental Health Services as necessary

- ☐ Conduct the food inspection and implement corrective actions

- ☐ Obtain a copy of the menu and provide it to the LHD Epidemiologist so an outbreak questionnaire my be developed

- ☐ Give the food employee surveys to the supervisor to hand out to all employees

- ☐ Collect the employee surveys as soon as possible or within three days

- ☐ Collect food or environmental specimens as necessary

- ☐ As directed, conduct a HACCP inspection of the food establishment

- ☐ Report all findings and provide reports to supervisor and the LHD Epidemiologist
    - Participate in conference calls with LHD Epidemiology, ADHS Epidemiology and ADHS Environmental Health as necessary

Example Gastroenteritis Surveillance Form for Employees

Name of the Facility: _____

Instructions for Employees: Please complete this form as soon as possible and return to your supervisor before the end of the day or work shift.

Name:_____ Age: _____ Sex: □ Male □ Female

Title: _____ Phone: _____

Type of Work: _____

Do you work as a food service employee at another establishment? □ Yes □ No

If yes, where? _____

Have you developed any of the following symptoms since ____/____/____ □ Yes □ No

If yes, what date did the symptoms start? ____/____/____ what time? _____ □ A.M. □ P.M.

Symptom	Yes	No	Don't Know	
Diarrhea				How many times in a 24hr period? _____
Abdominal cramps				
Vomiting				
Nausea				
Fever				How high? _____
Chills				
Headache				
Muscle ache				
Loss of appetite				
Bloody stool				
Skin infection				
Stool specimen submitted				Result? _____
Culture of skin infection				Result? _____

Did you completely recover? □ Yes □ No

If yes: Date: _____ Time _____ □ A.M. □ P.M.

Name: _____

Were you seen by a doctor for the above symptoms? □ Yes □ No

If yes, Doctor's Name and Phone _____

Do you know anyone else who had or has a similar illness? □ Yes □ No

Name _____ Phone ( )_____-_____

Name _____ Phone ( )_____-_____

Please list hours worked, specific duties during shift including foods prepped or prepared, and food items eaten at the facility on the menu for the following time period.

From____/____/____through____/____/____

Date	**Hours Worked**	**Specific Duties and Tasks**	**Foods and Drinks Consumed**

Other Comments:

_____

_____

_____

Exclusion Guidelines for Food Employees

Any person with a communicable disease listed in the table below should be excluded from food preparation, handling or serving. This should also include food employees with symptoms consistent with those diseases such as diarrhea, vomiting, abdominal cramping fever, jaundice, etc. Refer to *Arizona Administrative Code (A.A.C.) R9-6-301* through *393* for specific control measures for communicable diseases

Etiologic Agent	Recommendations for Exclusion for Food Employees
Campylobacter	Exclude until asymptomatic
Clostridium perfringens	Exclude until asymptomatic
Entamoeba histolytica	Exclude until chemotherapy is completed
E. coli O157:H7	Exclude until 2 consecutive negative stool cultures collected at least 24 hours apart and obtained at least 48 hours after discontinuance of antimicrobial therapy*
Enterotoxigenic E. coli (STEC)	Exclude until 2 consecutive negative stool cultures collected at least 24 hours apart and obtained at least 48 hours after discontinuance of antimicrobial therapy*
Cryptosporidium	Exclude until asymptomatic
Cyclospora	Exclude until asymptomatic
Giardia	Exclude until asymptomatic
Hepatitis A	1) Exclude for an interval extending through day 10 following onset of **jaundice** 2) Exclude for an interval extending through day 14 following onset of symptoms if **no jaundice** present
Salmonella (Non-typhoid)	Exclude until asymptomatic
Salmonelli typhi (Typhoid fever)	Exclude until 2 negative stools taken at least 24 hours apart and at least 48 hours after antibiotics have been stopped, and not earlier than 1 month after onset of symptoms
Salmonella typhi carriers	Exclude until 2 negative stools taken at least 24 hours apart and at least 48 hours after antibiotics have been stopped, and not earlier than 1 month after onset of symptoms
Shigella	Exclude until 2 consecutive negative stool cultures collected at least 24 hours apart and obtained at least 48 hours after discontinuance of antimicrobial therapy
Viral infections	Exclude until asymptomatic
Yersinia enterocolitica	Exclude until asymptomatic

* Antimicrobials are not usually administered with these infections because of the possibility of hemolytic uremic syndrome, especially in children.

These exclusion guidelines are recommendations of the ADHS and are based on current scientific literature and on CDC recommendations. **Final decisions regarding exclusion of individual food workers rest with the LHD and should be made with consideration given to the personal hygiene of the individual, the specific duties of the food worker, the nature of the food handled, and the level of hygienic conditions and supervision in the food establishment.**

HAZARD ANALYSIS AND CRITICAL CONTROL POINT (HACCP)

Overview

Hazard Analysis and Critical Control Point, or HACCP (pronounced HAS-SIP), is a systematic, science-based approach of identifying, evaluating, and controlling food safety hazards†. Initially developed to keep food safe for astronauts within the space program, this approach was adopted by the Food and Drug Administration and the U.S. Department of Agriculture as a means of ensuring a safe food supply from harvest to consumption. Currently, the seafood industry, juice industry, and meat and poultry processing plants are required to follow a HACCP plan, or a written documentation of all food processing and handling procedures. A number of food companies in the U. S. have also adopted a HACCP plan in their manufacturing processes.

The following table lists the seven fundamental HACCP principles.

HACCP Principles†
1. Conduct a hazard analysis
2. Identify the critical control points (CCP)
3. Establish critical limits for each CCP
4. Establish monitoring procedures
5. Establish corrective actions
6. Establish recordkeeping procedures
7. Establish verification procedures

†common hazards include microorganisms naturally found in meat or poultry products (i.e. *Campylobacter*, *Salmonella*), chemicals that are unintentially added to food (i.e. pesticides, cleaners), or foreign materials that are accidentally found in food (i.e. metal, plastic).

PRINCIPLE #2: Identify the critical control points (CCPs)
A critical control point (CCP) refers to a point, step, or procedure in the food process during which control measures may be applied to prevent, eliminate, or reduce hazards. An example of a CCP is the procedure of cooking poultry to 165º F to destroy microorganisms that may be present.

PRINCIPLE #3: Establish critical limits for each CCP
Critical limits are defined as the maximum or minimum value at which a biological, chemical, or physical hazard must be controlled at a given CCP to ensure food safety. An example of a critical limit includes holding temperatures, such as the minimum hot holding temperature of 140º F or the maximum cold holding temperature of 41º F.

† FDA. *HACCP: A State-of-the-Art Approach to Food Safety*. http://www.cfsan.fda.gov/~lrd/bghaccp.html

PRINCIPLE #4: Establish monitoring procedures
Monitoring procedures are those procedures that check, measure, and document the food process at a given CCP. An example of a monitoring procedure is the routine observation and recording of cooking times and temperatures.

PRINCIPLE #5: Establish corrective actions
When deviations or problems are identified through monitoring, corrective actions are initiated. An example of a corrective action is the disposing of food if the minimum cooking temperature is not met.

PRINCIPLE #6: Establish recordkeeping procedures
Recordkeeping is essential for the documentation of monitoring procedures, hazards identified, and actions taken to correct potential problems. Moreover, recordkeeping ensures that regulatory requirements are met.

PRINCIPLE #7: Establish verification procedures
Verification procedures are necessary to evaluate a HACCP system and determine if the system is working properly. Verification often involves the testing and reviewing of specific steps, quality control and assurance of equipment and procedures, and annual assessments.

Application of HACCP Principles during an Environmental Investigation

When a foodborne disease outbreak is identified in a food service establishment, food inspectors conduct an inspection that is based on the HACCP principles. Food inspectors follow the food process in the establishment, paying close attention to the preparation of suspect foods or foods implicated in the foodborne disease outbreak.

The following paragraphs describe the general procedures of a HACCP inspection during a foodborne disease outbreak investigation.

Introduction and purpose
Upon arrival at the food service establishment, the inspector should introduce himself to the person in charge and explain the purpose of the inspection.

Identification of ingredients and steps
The inspector should review the menu and identify the ingredients and steps involved in the receiving, storage, preparation and service of suspect food(s). The inspector should obtain recipes for all suspect food(s), identify the ingredients, and collect information about the source. The inspector should also pay close attention to potentially hazardous foods and high-risk preparation factors.

Identify critical control points
Based on the observations made, the inspector should identify critical control points and corrective actions to reduce potential hazards. Microbiological hazards account for the majority of foodborne illness; therefore, emphasis should be placed on contamination, survival, and growth/toxin production risks at these points.

Observe suspect food(s) through establishment
The inspector should observe the suspect food(s) and record the procedures conducted through the operation — from receipt of food from the delivery truck to consumption by the consumer.

All risk factors should be observed, including the food source, cooking and holding procedures, potential contamination factors, and poor personal hygiene. Inspectors should have the proper equipment (e.g., thermometers) to assist with these observations. Written documentation on how food(s) were handled and what equipment was used should be completed. Observation and documentation of who handled the food(s) during each preparation step should also be done to help determine if a specific food handler or particular role may have contributed to illness. A flow chart should be developed as a visual tool of the process.

Monitoring and corrective action procedures

Monitoring procedures and corrective actions should be established. These should be discussed in a brief exit interview with the person in charge.

Submit paperwork

Inspectors should write and submit a HACCP inspection report, complete with flow charts, recommendations, and other appropriate paperwork to their supervisor and the epidemiology investigator. Following submission of the report, the inspector should return to the food service establishment to present the report and discuss recommendations with the person in charge.

APPENDIX F

FOODBORNE ILLNESS AND ETIOLOGY TABLES

TABLE 1. Etiologic agents to consider for various manifestations of foodborne illness

Clinical presentation	Potential food-related agents to consider
Gastroenteritis (vomiting as primary symptom; fever and/or diarrhea also may be present)	Viral gastroenteritis, most commonly rotavirus in an infant or norovirus and other caliciviruses in an older child or adult; or food poisoning due to preformed toxins (eg, vomitoxin, *Staphylococcus aureus* toxin, *Bacillus cereus* toxin) and heavy metals.
Noninflammatory diarrhea (acute watery diarrhea without fever/dysentery; some patients may present with fever)*	Can be caused by virtually all enteric pathogens (bacterial, viral, parasitic) but is a classic symptom of Enterotoxigenic *Escherichia coli* *Giardia* *Vibrio cholerae* Enteric viruses (astroviruses, noroviruses and other caliciviruses, enteric adenovirus, rotavirus) *Cryptosporidium* *Cyclospora cayetanensis*
Inflammatory diarrhea (invasive gastroenteritis; grossly bloody stool and fever may be present)†	*Shigella* species *Campylobacter* species *Salmonella* species Enteroinvasive *E. coli* Enterohemorrhagic *E. coli* *E. coli* O157:H7 *Vibrio parahaemolyticus* *Yersinia enterocolitica* *Entamoeba histolytica*
Persistent diarrhea (lasting ≥14 days)	Prolonged illness should prompt examination for parasites, particularly in travelers to mountainous or other areas where untreated water is consumed. Consider *Cyclospora cayetanensis, Cryptosporidium, Entamoeba histolytica,* and *Giardia lamblia*.
Neurologic manifestations (eg, paresthesias, respiratory depression, bronchospasm, cranial nerve palsies)	Botulism (*Clostridium botulinum* toxin) Organophosphate pesticides Thallium poisoning Scombroid fish poisoning (histamine, saurine) Ciguatera fish poisoning (ciguatoxin) Tetradon fish poisoning (tetradotoxin) Neurotoxic shellfish poisoning (brevitoxin) Paralytic shellfish poisoning (saxitoxin) Amnesic shellfish poisoning (domoic acid) Mushroom poisoning Guillain-Barré syndrome (associated with infectious diarrhea due to *Campylobacter jejuni*)
Systemic illness (eg, fever, weakness, arthritis, jaundice)	*Listeria monocytogenes* *Brucella* species *Trichinella spiralis* *Toxoplasma gondii* *Vibrio vulnificus* Hepatitis A and E viruses *Salmonella* Typhi and *Salmonella* Paratyphi Amebic liver abscess

* Noninflammatory diarrhea is characterized by mucosal hypersecretion or decreased absorption without mucosal destruction and generally involves the small intestine. Some affected patients may be dehydrated because of severe watery diarrhea and may appear seriously ill. This is more common in the young and the elderly. Most patients experience minimal dehydration and appear mildly ill with scant physical findings. Illness typically occurs with abrupt onset and brief duration. Fever and systemic symptoms usually are absent (except for symptoms related directly to intestinal fluid loss).

† Inflammatory diarrhea is characterized by mucosal invasion with resulting inflammation and is caused by invasive or cytotoxigenic microbial pathogens. The diarrheal illness usually involves the large intestine and may be associated with fever, abdominal pain and tenderness, headache, nausea, vomiting, malaise, and myalgia. Stools may be bloody and may contain many fecal leukocytes.

Foodborne Illnesses (Bacterial)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Bacillus anthracis	2 days to weeks	Nausea, vomiting, malaise, bloody diarrhea, acute abdominal pain.	Weeks	Insufficiently cooked contaminated meat.	Blood.	Penicillin is first choice for naturally acquired gastrointestinal anthrax. Ciprofloxacin is second option.
Bacillus cereus (preformed enterotoxin)	1–6 hrs	Sudden onset of severe nausea and vomiting. Diarrhea may be present.	24 hrs	Improperly refrigerated cooked or fried rice, meats.	Normally a clinical diagnosis. Clinical laboratories do not routinely identify this organism. If indicated, send stool and food specimens to reference laboratory for culture and toxin identification.	Supportive care.
Bacillus cereus (diarrheal toxin)	10–16 hours	Abdominal cramps, watery diarrhea, nausea.	24–48 hours	Meats, stews, gravies, vanilla sauce.	Testing not necessary, self-limiting (consider testing food and stool for toxin in outbreaks).	Supportive care.
Brucella abortus, *B. melitensis*, and *B. suis*	7–21 days	Fever, chills, sweating, weakness, headache, muscle and joint pain, diarrhea, bloody stools during acute phase.	Weeks	Raw milk, goat cheese made from unpasteurized milk, contaminated meats.	Blood culture and positive serology.	*Acute:* Rifampin and doxycycline daily for ≥6 weeks. Infections with complications require combination therapy with rifampin, tetracycline, and an aminoglycoside.
Campylobacter jejuni	2–5 days	Diarrhea, cramps, fever, and vomiting; diarrhea may be bloody.	2–10 days	Raw and undercooked poultry, unpasturized milk, contaminated water.	Routine stool culture; *Campylobacter* requires special media and incubation at 42°C to grow.	Supportive care. For severe cases, antibiotics such as erythromycin and quinolones may be indicated early in the diarrheal disease. Guillain-Barré syndrome can be a sequela.
Clostridium botulinum—children and adults (preformed toxin)	12–72 hrs	Vomiting, diarrhea, blurred vision, diplopia, dysphagia, and descending muscle weakness.	Variable (from days to months). Can be complicated by respiratory failure and death.	Home-canned foods with a low acid content, improperly canned commercial foods, home-canned or fermented fish, herb-infused oils, baked potatoes in aluminium foil, cheese sauce, bottled garlic, foods held warm for extended periods of time (eg, in a warm oven).	Stool, serum, and food can be tested for toxin. Stool and food can also be cultured for the organism. These tests can be performed at some state health department laboratories and CDC.	Supportive care. Botulinum antitoxin is helpful if given early in the course of the illness. Contact the state health department. The 24-hour number for state health departments to call is (770) 488-7100.
Clostridium botulinum—infants	3–30 days	In infants <12 months, lethargy, weakness, poor feeding, constipation, hypotonia, poor head control, poor gag and sucking reflex.	Variable	Honey, home-canned vegetables and fruits, corn syrup.	Stool, serum, and food can be tested for toxin. Stool and food can also be cultured for the organism. These tests can be performed at some state health department laboratories and CDC.	Supportive care. Botulism immune globulin can be obtained from the Infant Botulism Prevention Program, Health and Human Services, California (510-540-2646). Botulinum antitoxin is generally not recommended for infants.
Clostridium perfringens toxin	8–16 hrs	Watery diarrhea, nausea, abdominal cramps; fever is rare.	24–48 hrs	Meats, poultry, gravy, dried or precooked foods, time- and/or temperature-abused food.	Stools can be tested for enterotoxin and cultured for organism. Because *Clostridium perfringens* can normally be found in stool, quantitative cultures must be done.	Supportive care. Antibiotics not indicated.
Enterohemorrhagic *E. coli* (EHEC) including *E. coli* O157:H7 and other Shiga toxin-producing *E. coli* (STEC)	1–8 days	Severe diarrhea that is often bloody, abdominal pain and vomiting. Usually, little or no fever is present. More common in children <4 years.	5–10 days	Undercooked beef especially hamburger, unpasteurized milk and juice, raw fruits and vegetables (eg. sprouts), salami (rarely), and contaminated water.	Stool culture; *E. coli* O157:H7 requires special media to grow. If *E. coli* O157:H7 is suspected, specific testing must be requested. Shiga toxin testing may be done using commercial kits; positive isolates should be forwarded to public health laboratories for confirmation and serotyping.	Supportive care, monitor renal function, hemoglobin, and platelets closely. *E. coli* O157:H7 infection is also associated with hemolytic uremic syndrome (HUS), which can cause lifelong complications. Studies indicate that antibiotics may promote the development of HUS.

Foodborne Illnesses (Bacterial) (*Continued*)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Enterotoxigenic *E. coli* (ETEC)	1–3 days	Watery diarrhea, abdominal cramps, some vomiting.	3 to >7 days	Water or food contaminated with human feces.	Stool culture. ETEC requires special laboratory techniques for identification. If suspected, must request specific testing.	Supportive care. Antibiotics are rarely needed except in severe cases. Recommended antibiotics include TMP-SMX and quinolones.
Listeria monocytogenes	9–48 hrs for gastrointestinal symptoms, 2–6 weeks for invasive disease	Fever, muscle aches, and nausea or diarrhea. Pregnant women may have mild flu-like illness, and infection can lead to premature delivery or stillbirth. Elderly or immunocompromised patients may have bacteremia or meningitis.	Variable	Fresh soft cheeses, unpasteurized milk, inadequately pasteurized milk, ready-to-eat deli meats, hot dogs.	Blood or cerebrospinal fluid cultures. Asymptomatic fecal carriage occurs; therefore, stool culture usually not helpful. Antibody to listerolysin O may be helpful to identify outbreak retrospectively.	Supportive care and antibiotics; Intravenous ampicillin, penicillin, or TMP-SMX are recommended for invasive disease.
	At birth and infancy	Infants infected from mother at risk for sepsis or meningitis.				
Salmonella spp.	1–3 days	Diarrhea, fever, abdominal cramps, vomiting. *S.* Typhi and *S.* Paratyphi produce typhoid with insidious onset characterized by fever, headache, constipation, malaise, chills, and myalgia; diarrhea is uncommon, and vomiting is not usually severe.	4–7 days	Contaminated eggs, poultry, unpasteurized milk or juice, cheese, contaminated raw fruits and vegetables (alfalfa sprouts, melons). *S.* Typhi epidemics are often related to fecal contamination of water supplies or street-vended foods.	Routine stool cultures.	Supportive care. Other than for *S.* Typhi and *S.* Paratyphi, antibiotics are not indicated unless there is extra-intestinal spread, or the risk of extra-intestinal spread, of the infection. Consider ampicillin, gentamicin, TMP-SMX, or quinolones if indicated. A vaccine exists for *S.* Typhi.
Shigella spp.	24–48 hrs	Abdominal cramps, fever, and diarrhea. Stools may contain blood and mucus.	4–7 days	Food or water contaminated with human fecal material. Usually person-to-person spread, fecal–oral transmission. Ready-to-eat foods touched by infected food workers, eg, raw vegetables, salads, sandwiches.	Routine stool cultures.	Supportive care. TMP-SMX recommended in the US if organism is susceptible; nalidixic acid or other quinolones may be indicated if organism is resistant, especially in developing countries.
Staphylococcus aureus (preformed enterotoxin)	1–6 hrs	Sudden onset of severe nausea and vomiting. Abdominal cramps. Diarrhea and fever may be present.	24–48 hrs	Unrefrigerated or improperly refrigerated meats, potato and egg salads, cream pastries.	Normally a clinical diagnosis. Stool, vomitus, and food can be tested for toxin and cultured if indicated.	Supportive care.
Vibrio cholerae (toxin)	24–72 hrs	Profuse watery diarrhea and vomiting, which can lead to severe dehydration and death within hours.	3–7 days. Causes life-threatening dehydration.	Contaminated water, fish, shellfish, street-vended food typically from Latin America or Asia.	Stool culture; *Vibrio cholerae* requires special media to grow. If *V. cholerae* is suspected, must request specific testing.	Supportive care with aggressive oral and intravenous rehydration. In cases of confirmed cholera, tetracycline or doxycycline is recommended for adults, and TMP-SMX for children (<8 years).
Vibrio parahaemolyticus	2–48 hrs	Watery diarrhea, abdominal cramps, nausea, vomiting.	2–5 days	Undercooked or raw seafood, such as fish, shellfish.	Stool cultures. *Vibrio parahaemolyticus* requires special media to grow. If *V. parahaemolyticus* is suspected, must request specific testing.	Supportive care. Antibiotics are recommended in severe cases: tetracycline, doxycycline, gentamicin, and cefotaxime.
Vibrio vulnificus	1–7 days	Vomiting, diarrhea, abdominal pain, bacteremia, and wound infections. More common in the immunocompromised, or in patients with chronic liver disease (presenting with bullous skin lesions). Can be fatal in patients with liver disease and the immunocompromised.	2–8 days	Undercooked or raw shellfish, especially oysters, other contaminated seafood, and open wounds exposed to sea water.	Stool, wound, or blood cultures. *Vibrio vulnificus* requires special media to grow. If *V. vulnificus* is suspected, must request specific testing.	Supportive care and antibiotics; tetracycline, doxycycline, and ceftazidime are recommended.

Foodborne Illnesses (Bacterial) (*Continued*)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Yersinia enterocolytica and *Y. pseudotuberculosis*	24–48 hrs	Appendicitis-like symptoms (diarrhea and vomiting, fever, and abdominal pain) occur primarily in older children and young adults. May have a scarlitiniform rash with *Y. pseudotuberculosis*.	1–3 weeks, usually self-limiting	Undercooked pork, unpasteurized milk, tofu, contaminated water. Infection has occurred in infants whose caregivers handled chitterlings.	Stool, vomitus, or blood culture. *Yersinia* requires special media to grow. If suspected, must request specific testing. Serology is available in research and reference laboratories.	Supportive care. If septicemia or other invasive disease occurs, antibiotic therapy with gentamicin or cefotaxime (doxycycline and ciprofloxacin also effective).

Foodborne Illnesses (Viral)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Hepatitis A	28 days average (15–50 days)	Diarrhea, dark urine, jaundice, and flu-like symptoms, i.e., fever, headache, nausea, and abdominal pain.	Variable, 2 weeks – 3 months	Shellfish harvested from contaminated waters, raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with infected food handler.	Increase in ALT, bilirubin. Positive IgM and anti-hepatitis A antibodies.	Supportive care. Prevention with immunization.
Noroviruses (and other caliciviruses)	12–48 hrs	Nausea, vomiting, abdominal cramping, diarrhea, fever, myalgia, and some headache. Diarrhea is more prevalent in adults and vomiting is more prevalent in children.	12–60 hrs	Shellfish, fecally contaminated foods, ready-to-eat foods touched by infected food workers (salads, sandwiches, ice, cookies, fruit).	Routine RT-PCR and EM on fresh unpreserved stool samples. Clinical diagnosis, negative bacterial cultures. Stool is negative for WBCs.	Supportive care such as rehydration. Good hygiene.
Rotavirus	1–3 days	Vomiting, watery diarrhea, low-grade fever. Temporary lactose intolerance may occur. Infants and children, elderly, and immunocompromised are especially vulnerable.	4–8 days	Fecally contaminated foods. Ready-to-eat foods touched by infected food workers (salads, fruits).	Identification of virus in stool via immunoassay.	Supportive care. Severe diarrhea may require fluid and electrolyte replacement.
Other viral agents (astroviruses, adenoviruses, parvoviruses)	10–70 hrs	Nausea, vomiting, diarrhea, malaise, abdominal pain, headache, fever.	2–9 days	Fecally contaminated foods. Ready-to-eat foods touched by infected food workers. Some shellfish.	Identification of the virus in early acute stool samples. Serology. Commercial ELISA kits are now available for adenoviruses and astroviruses.	Supportive care, usually mild, self-limiting. Good hygiene.

Foodborne Illnesses (Parasitic)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Angiostrongylus cantonensis	1 week to ≥1 month	Severe headaches, nausea, vomiting, neck stiffness, paresthesias, hyperesthesias, seizures, and other neurologic abnormalities.	Several weeks to several months	Raw or undercooked intermediate hosts (eg, snails or slugs), infected paratenic (transport) hosts (eg, crabs, fresh water shrimp), fresh produce contaminated with intermediate or transport hosts.	Examination of CSF for elevated pressure, protein, leukocytes, and eosinophils; serologic testing using ELISA to detect antibodies to *Angiostrongylus cantonensis*.	Supportive care. Repeat lumbar punctures and use of corticosteroid therapy may be used for more severely ill patients.
Cryptosporidium	2–10 days	Diarrhea (usually watery), stomach cramps, upset stomach, slight fever.	May be remitting and relapsing over weeks to months	Any uncooked food or food contaminated by an ill food handler after cooking, drinking water.	Request specific examination of the stool for *Cryptosporidium*. May need to examine water or food.	Supportive care, self-limited. If severe consider paromomycin for 7 days. For children aged 1–11 years, consider nitazoxanide for 3 days.
Cyclospora cayetanensis	1–14 days, usually at least 1 week	Diarrhea (usually watery), loss of appetite, substantial loss of weight, stomach cramps, nausea, vomiting, fatigue.	May be remitting and relapsing over weeks to months	Various types of fresh produce (imported berries, lettuce).	Request specific examination of the stool for *Cyclospora*. May need to examine water or food.	TMP-SMX for 7 days.

Foodborne Illnesses (Parasitic) (*Continued*)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Entamoeba histolytica	2–3 days to 1–4 weeks	Diarrhea (often bloody), frequent bowel movements, lower abdominal pain.	May be protracted (several weeks to several months)	Any uncooked food or food contaminated by an ill food handler after cooking, drinking water.	Examination of stool for cysts and parasites—may need at least 3 samples. Serology for long-term infections.	Metronidazole and a luminal agent (iodoquinol or paromomycin).
Giardia lamblia	1–2 weeks	Diarrhea, stomach cramps, gas.	Days to weeks	Any uncooked food or food contaminated by an ill food handler after cooking, drinking water.	Examination of stool for ova and parasites — may need at least 3 samples.	Metronidazole.
Toxoplasma gondii	5–23 days	Generally asymptomatic, 20% may develop cervical lymphadenopathy and/or a flu-like illness. In immunocompromised patients: central nervous system (CNS) disease, myocarditis, or pneumonitis is often seen.	Months	Accidental ingestion of contaminated substances (eg, soil contaminated with cat feces on fruits and vegetables), raw or partly cooked meat (especially pork, lamb, or venison).	Isolation of parasites from blood or other body fluids; observation of parasites in patient specimens via microscopy or histology. Detection of organisms is rare; serology (reference laboratory needed) can be a useful adjunct in diagnosing toxoplasmosis. However, IgM antibodies may persist for 6–18 months and thus may not necessarily indicate recent infection. PCR of bodily fluids. For congenital infection: isolation of *T. gondii* from placenta, umbilical cord, or infant blood. PCR of white blood cells, CSF, or amniotic fluid, or IgM and IgA serology, performed by a reference laboratory.	Asymptomatic healthy, but infected, persons do not require treatment. Spiramycin or pyrimethamine plus sulfadiazine may be used for pregnant women. Pyrimethamine plus sulfadiazine may be used for immunocompromised persons, in specific cases. Pyrimethamine plus sulfadiazine (with or without steroids) may be given for ocular disease when indicated. Folinic acid is given with pyrimethamine plus sulfadiazine to counteract bone marrow suppression.
Toxoplasma gondii (congenital infection)	In infants at birth	Treatment of the mother may reduce severity and/or incidence of congenital infection. Most infected infants have few symptoms at birth. Later, they will generally develop signs of congenital toxoplasmosis (mental retardation, severely impaired eyesight, cerebral palsy, seizures), unless the infection is treated.	Months	Passed from mother (who acquired acute infection during pregnancy) to child.		
Trichinella spiralis	1–2 days for initial symptoms; others begin 2–8 weeks after infection	Acute: nausea, diarrhea, vomiting, fatigue, fever, abdominal discomfort followed by muscle soreness, weakness, and occasional cardiac and neurologic complications.	Months	Raw or undercooked contaminated meat, usually pork or wild game meat (eg, bear or moose).	Positive serology or demonstration of larvae via muscle biopsy. Increase in eosinophils.	Supportive care plus mebendazole or albendazole.

Foodborne Illnesses (Noninfectious)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Antimony	5 min – 8 hrs. usually <1 hr	Vomiting, metallic taste.	Usually self-limited	Metallic container.	Identification of metal in beverage or food.	Supportive care.
Arsenic	Few hrs	Vomiting, colic, diarrhea.	Several days	Contaminated food.	Urine. May cause eosinophilia.	Gastric lavage, BAL (dimercaprol).
Cadmium	5 min – 8 hrs. usually <1 hr	Nausea, vomiting, myalgia, increase in salivation, stomach pain.	Usually self-limited	Seafood, oysters, clams, lobster, grains, peanuts.	Identification of metal in food.	Supportive care.
Ciguatera fish poisoning (ciguatera toxin)	2–6 hrs	GI: abdominal pain, nausea, vomiting, diarrhea.	Days to weeks to months	A variety of large reef fish. Grouper, red snapper, amberjack, and barracuda (most common).	Radioassay for toxin in fish or a consistent history.	Supportive care, IV mannitol. Children more vulnerable.
	3 hrs	Neurologic: paresthesias, reversal of hot or cold, pain, weakness.				
	2–5 days	Cardiovascular: bradycardia, hypotension, increase in T wave abnormalities.				
Copper	5 min – 8 hrs. usually <1 hr	Nausea, vomiting, blue or green vomitus.	Usually self-limited	Metallic container.	Identification of metal in beverage or food.	Supportive care.
Mercury	1 week or longer	Numbness, weakness of legs, spastic paralysis, impaired vision, blindness, coma. Pregnant women and the developing fetus are especially vulnerable.	May be protracted	Fish exposed to organic mercury, grains treated with mercury fungicides.	Analysis of blood, hair.	Supportive care.
Mushroom toxins, short-acting (muscinol, muscarine, psilocybin, coprius artemetaris, ibotenic acid)	<2 hrs	Vomiting, diarrhea, confusion, visual disturbance, salivation, diaphoresis, hallucinations, disulfiram-like reaction, confusion, visual disturbance.	Self-limited	Wild mushrooms (cooking may not destroy these toxins).	Typical syndrome and mushroom identified or demonstration of the toxin.	Supportive care.
Mushroom toxin, long-acting (amanitin)	4–8 hrs diarrhea; 24–48 hrs liver failure	Diarrhea, abdominal cramps, leading to hepatic and renal failure.	Often fatal	Mushrooms.	Typical syndrome and mushroom identified and/or demonstration of the toxin.	Supportive care, life-threatening, may need life support.
Nitrite poisoning	1–2 hrs	Nausea, vomiting, cyanosis, headache, dizziness, weakness, loss of consciousness, chocolate-brown colored blood.	Usually self-limited	Cured meats, any contaminated foods, spinach exposed to excessive nitrification.	Analysis of the food, blood.	Supportive care, methylene blue.
Pesticides (organophosphates or carbamates)	Few min to few hrs	Nausea, vomiting, abdominal cramps, diarrhea, headache, nervousness, blurred vision, twitching, convulsions, salivation and meiosis.	Usually self-limited	Any contaminated food.	Analysis of the food, blood.	Atropine; 2-PAM (Pralidoxime) is used when atropine is not able to control symptoms and is rarely necessary in carbamate poisoning.
Puffer fish (tetrodotoxin)	<30 min	Parasthesias, vomiting, diarrhea, abdominal pain, ascending paralysis, respiratory failure.	Death usually in 4–6 hours	Puffer fish.	Detection of tetrodotoxin in fish.	Life-threatening, may need respiratory support.
Scombroid (histamine)	1 min – 3 hrs	Flushing, rash, burning sensation of skin, mouth and throat, dizziness, uriticaria, parasthesias.	3–6 hrs	Fish: bluefin, tuna, skipjack, mackerel, marlin, escolar, and mahi mahi.	Demonstration of histamine in food or clinical diagnosis.	Supportive care, antihista-mines.

Foodborne Illnesses (Noninfectious) (*Continued*)

Etiology	Incubation Period	Signs and Symptoms	Duration of Illness	Associated Foods	Laboratory Testing	Treatment
Shellfish toxins (diarrheic, neurotoxic, amnesic)	Diarrheic shellfish poisoning (DSP) — 30 min to 2 hrs	Nausea, vomiting, diarrhea, and abdominal pain accompanied by chills, headache, and fever.	Hrs to 2–3 days	A variety of shellfish, primarily mussels, oysters, scallops, and shellfish from the Florida coast and the Gulf of Mexico.	Detection of the toxin in shellfish; high-pressure liquid chromatography.	Supportive care, generally self-limiting. Elderly are especially sensitive to ASP.
	Neurotoxic shellfish poisoning (NSP) — few min to hours	Tingling and numbness of lips, tongue, and throat, muscular aches, dizziness, reversal of the sensations of hot and cold, diarrhea, and vomiting.				
	Amnesic shellfish poisoning (ASP) — 24–48 hrs	Vomiting, diarrhea, abdominal pain and neurologic problems such as confusion, memory loss, disorientation, seizure, coma.				
Shellfish toxins (paralytic shellfish poisoning)	30 min – 3 hrs	Diarrhea, nausea, vomiting leading to parasthesias of mouth, lips, weakness, dysphasia, dysphonia, respiratory paralysis.	Days	Scallops, mussels, clams, cockles.	Detection of toxin in food or water where fish are located; high-pressure liquid chromatography.	Life-threatening, may need respiratory support.
Sodium fluoride	Few min to 2 hrs	Salty or soapy taste, numbness of mouth, vomiting, diarrhea, dilated pupils, spasms, pallor, shock, collapse.	Usually self-limited	Dry foods (eg, dry milk, flour, baking powder, cake mixes) contaminated with sodium fluoride–containing insecticides and rodenticides.	Testing of vomitus or gastric washings. Analysis of the food.	Supportive care.
Thallium	Few hrs	Nausea, vomiting, diarrhea, painful parathesias, motor polyneuropathy, hair loss.	Several days	Contaminated food.	Urine, hair.	Supportive care.
Tin	5 min – 8 hrs. usually <1 hr	Nausea, vomiting, diarrhea.	Usually self-limited	Metallic container.	Analysis of the food.	Supportive care.
Vomitoxin	Few min to 3 hrs	Nausea, headache, abdominal pain, vomiting.	Usually self-limited	Grains such as wheat, corn, barley.	Analysis of the food.	Supportive care.
Zinc	Few hrs	Stomach cramps, nausea, vomiting, diarrhea, myalgias.	Usually self-limited	Metallic container.	Analysis of the food, blood and feces, saliva or urine.	Supportive care.

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
Bacterial			
1. *Bacillus cereus*			
a. Vomiting toxin	1–6 hrs	Vomiting; some patients with diarrhea; fever uncommon	Isolation of organism from stool of two or more ill persons and not from stool of control patients OR Isolation of 10^5 organisms/g from epidemiologically implicated food, provided specimen is properly handled
b. Diarrheal toxin	6–24 hrs	Diarrhea, abdominal cramps, and vomiting in some patients; fever uncommon	Isolation of organism from stool of two or more ill persons and not from stool of control patients OR Isolation of 10^5 organisms/g from epidemiologically implicated food, provided specimen is properly handled
2. *Brucella*	Several days to several mos; usually >30 days	Weakness, fever, headache, sweats, chills, arthralgia, weight loss, splenomegaly	Two or more ill persons and isolation of organism in culture of blood or bone marrow; greater than fourfold increase in standard agglutination titer (SAT) over several wks, or single SAT 1:160 in person who has compatible clinical symptoms and history of exposure
3. *Campylobacter jejuni/coli*	2–10 days; usually 2–5 days	Diarrhea (often bloody), abdominal pain, fever	Isolation of organism from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
4. *Clostridium botulinum*	2 hrs–8 days; usually 12–48 hrs	Illness of variable severity; common symptoms are diplopia, blurred vision, and bulbar weakness; paralysis, which is usually descending and bilateral, might progress rapidly	Detection of botulinal toxin in serum, stool, gastric contents, or implicated food OR Isolation or organism from stool or intestine
5. *Clostridium perfringens*	6–24 hrs	Diarrhea, abdominal cramps; vomiting and fever uncommon	Isolation of 10^5 organisms/g from stool of two or more ill persons, provided specimen is properly handled. OR Demonstration of enterotoxin in the stool of two or more ill persons OR Isolation of 10^5 organisms/g from epidemiologically implicated food, provided specimen is properly handled
6. *Escherichia coli*			
a. Enterohemorrhagic (*E. coli* O157:H7 and others)	1–10 days; usually 3–4 days	Diarrhea (often bloody), abdominal cramps (often severe), little or no fever	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from clinical specimen from two or more ill persons OR Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from epidemiologically implicated food
b. Enterotoxigenic (ETEC)	6–48 hrs	Diarrhea, abdominal cramps, nausea; vomiting and fever less common	Isolation of organism of same serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from stool of two or more ill persons
c. Enteropathogenic (EPEC)	Variable	Diarrhea, fever, abdominal cramps	Isolation of organism of same enteropathogenic serotype from stool of two or more ill persons

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
d. Enteroinvasive (EIEC)	Variable	Diarrhea (might be bloody), fever, abdominal cramps	Isolation of same enteroinvasive serotype from stool of two or more ill persons
7. *Listeria monocytogenes*			
a. Invasive disease	2–6 wks	Meningitis, neonatal sepsis, fever	Isolation of organism from normally sterile site
b. Diarrheal disease	Unknown	Diarrhea, abdominal cramps, fever	Isolation of organism of same serotype from stool of two or more ill persons exposed to food that is epidemiologically implicated or from which organism of same serotype has been isolated
8. Nontyphoidal *Salmonella*	6 hrs–10 days; usually 6–48 hrs	Diarrhea, often with fever and abdominal cramps	Isolation of organism of same serotype from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food
9. *Salmonella* Typhi	3–60 days; usually 7–14 days	Fever, anorexia, malaise, headache, and myalgia; sometimes diarrhea or constipation	Isolation of organism from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food
10. *Shigella* spp.	12 hrs–6 days; usually 2–4 days	Diarrhea (often bloody), often accompanied by fever and abdominal cramps	Isolation of organism of same serotype from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
11. *Staphylococcus aureus*	30 min–8 hrs; usually 2–4 hrs	Vomiting, diarrhea	Isolation of organism of same phage type from stool or vomitus of two or more ill persons OR Detection of enterotoxin in epidemiologically implicated food OR Isolation of 10^5 organisms/g from epidemiologically implicated food, provided specimen is properly handled
12. *Streptococcus,* group A	1–4 days	Fever, pharyngitis, scarlet fever, upper respiratory infection	Isolation of organism of same M- or T-type from throats of two or more ill persons OR Isolation of organism of same M- or T-type from epidemiologically implicated food
13. *Vibrio cholerae*			
a. O1 or O139	1–5 days	Watery diarrhea, often accompanied by vomiting	Isolation of toxigenic organism from stool or vomitus of two or more ill persons OR Significant rise in vibriocidal, bacterial-agglutinating, or antitoxin antibodies in acute- and early convalescent-phase sera among persons not recently immunized OR Isolation of toxigenic organism from epidemiologically implicated food
b. non-O1 and non-O139	1–5 days	Watery diarrhea	Isolation of organism of same serotype from stool of two or more ill persons

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
14. *Vibrio parahaemolyticus*	4–30 hrs	Diarrhea	Isolation of Kanagawa-positive organism from stool of two or more ill persons OR Isolation of 10^5 Kanagawa-positive organisms/g from epidemiologically implicated food, provided specimen is properly handled
15. *Yersinia enterocolitica*	1–10 days; usually 4–6 days	Diarrhea, abdominal pain (often severe)	Isolation of organism from clinical specimen from two or more ill persons OR Isolation of pathogenic strain of organism from epidemiologically implicated food
Chemical			
1. Marine toxins			
a. Ciguatoxin	1–48 hrs; usually 2–8 hrs	Usually gastrointestinal symptoms followed by neurologic symptoms (including paresthesia of lips, tongue, throat, or extremities) and reversal of hot and cold sensation	Demonstration of ciguatoxin in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten a type of fish previously associated with ciguatera fish poisoning (e.g., snapper, grouper, or barracuda)
b. Scombroid toxin (histamine)	1 min–3 hrs; usually <1 hr	Flushing, dizziness, burning of mouth and throat, headache, gastrointestinal symptoms, urticaria, and generalized pruritis	Demonstration of histamine in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten a type of fish previously associated with histamine fish poisoning (e.g., mahi-mahi or fish of order Scomboidei)

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
c. Paralytic or neurotoxic shellfish	30 min–3 hrs	Paresthesia of lips, mouth or face, and extremities; intestinal symptoms or weakness, including respiratory difficulty	Detection of toxin in epidemiologically implicated food OR Detection of large numbers of shellfish-poisoning–associated species of dinoflagellates in water from which epidemiologically implicated mollusks are gathered
d. Puffer fish, tetrodotoxin	10 min–3 hrs; usually 10–45 min	Paresthesia of lips, tongue, face, or extremities, often following numbness; loss of proprioception or floating sensations	Demonstration of tetrodotoxin in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten puffer fish
2. Heavy metals • Antimony • Cadmium • Copper • Iron • Tin • Zinc	5 min–8 hrs; usually <1 hr	Vomiting, often metallic taste	Demonstration of high concentration of metal in epidemiologically implicated food
3. Monosodium glutamate (MSG)	3 min–2 hrs; usually <1 hr	Burning sensation in chest, neck, abdomen, or extremities; sensation of lightness and pressure over face or heavy feeling in chest	Clinical syndrome among persons who have eaten food containing MSG (e.g., usually 1.5 g MSG)
4. Mushroom toxins a. Shorter-acting toxins	2 hrs	Usually vomiting and diarrhea, other symptoms differ with toxin	Clinical syndrome among persons who have eaten mushroom identified as toxic type OR Demonstration of toxin in epidemiologically implicated mushroom or food containing mushroom
• Muscimol • Muscarine • Psilocybin • *Coprinus artrementaris* • Ibotenic acid		• Confusion, visual disturbance • Salivation, diaphoresis • Hallucinations • Disulfiram-like reaction • Confusion, visual disturbance	

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
b. Longer-acting toxins (e.g., *Amanita* spp.)	6–24 hrs	Diarrhea and abdominal cramps for 24 hrs followed by hepatic and renal failure	Clinical syndrome among persons who have eaten mushroom identified as toxic type OR Demonstration of toxin in epidemiologically implicated mushroom or food containing mushrooms
Parasitic			
1. *Cryptosporidium parvum*	2–28 days; median: 7 days	Diarrhea, nausea, vomiting; fever	Demonstration of organism or antigen in stool or in small-bowel biopsy of two or more ill persons OR Demonstration of toxin in epidemiologically implicated food
2. *Cyclospora cayetanensus*	1–11 days; median: 7 days	Fatigue, protracted diarrhea, often relapsing	Demonstration of organism in stool of two or more ill persons
3. *Giardia lamblia*	3–25 days; median: 7 days	Diarrhea, gas, cramps, nausea, fatigue	Two or more ill persons and detection of antigen in stool or demonstration of organism in stool, duodenal contents, or small-bowel biopsy specimen
4. *Trichinella* spp.	1–2 days for intestinal phase; 2–4 wks for systemic phase	Fever, myalgia, periorbital edema, high eosinophil count	Two or more ill persons and positive serologic test or demonstration of larvae in muscle biopsy OR Demonstration of larvae in epidemiologically implicated meat

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
Viral			
1. Hepatitis A	15–50 days; median: 28 days	Jaundice, dark urine, fatigue, anorexia, nausea	Detection of immunoglobulin M anti-hepatitis A virus in serum from two or more persons who consumed epidemiologically implicated food
2. Norwalk family of viruses, small round-structured viruses (SRSV)	15–77 hrs; usually 24–48 hrs	Vomiting, cramps, diarrhea, headache	More than fourfold rise in antibody titer to Norwalk virus or Norwalk-like virus in acute and convalescent sera in most serum pairs OR Visualization of small, round-structured viruses that react with patient's convalescent sera but not acute sera — by immune-electron microsopy (assays based on molecular diagnostics [e.g., polymerase-chain reaction, probes, or assays for antigen and antibodies from expressed antigen] are available in reference laboratories)
3. Astrovirus, calicivirus, others	15–77 hrs; usually 24–48 hrs	Vomiting, cramps, diarrhea, headache	Visualization of small, round-structured viruses that react with patient's convalescent sera but not acute sera — by immune-electron microsopy (assays based on molecular diagnostics [e.g., polymerase-chain reaction, probes, or assays for antigen and antibodies from expressed antigen] are available in reference laboratories)

Onset, duration, and symptoms of foodborne illness - Epidemiology summary table

FDA Bad Bug Book: Foodborne Pathogenic Microorganisms and Natural Toxins Handbook

http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/ucm071342.htm

Approximate onset time to symptoms	Predominant symptoms	Associated organism or toxin
Upper gastrointestinal tract symptoms (nausea, vomiting) occur first or predominate		
Less than 1 h	Nausea, vomiting, unusual taste, burning of mouth.	Metallic salts
1-2 h	Nausea, vomiting, cyanosis, headache, dizziness, dyspnea, trembling, weakness, loss of consciousness.	Nitrites
1-6 h mean 2-4 h	Nausea, vomiting, retching, diarrhea, abdominal pain, prostration.	*Staphylococcus aureus* and its enterotoxins
8-16 h (2-4 h emesis possible)	Vomiting, abdominal cramps, diarrhea, nausea.	*Bacillus cereus*
6-24 h	Nausea, vomiting, diarrhea, thirst, dilation of pupils, collapse, coma.	Amanita species mushrooms
Sore throat and respiratory symptoms occur		
12-72 h	Sore throat, fever, nausea, vomiting, rhinorrhea, sometimes a rash.	*Streptococcus pyogenes*
2-5 days	Inflamed throat and nose, spreading grayish exudate, fever, chills, sore throat, malaise, difficulty in swallowing, edema of cervical lymph node.	*Corynebacterium diphtheriae*
Lower gastrointestinal tract symptoms (abdominal cramps, diarrhea) occur first or predominate		
2-36 h, mean 6-12 h	Abdominal cramps, diarrhea, putrefactive diarrhea associated with *C. perfringens*, sometimes nausea and vomiting.	*Clostridium perfringens, Bacillus cereus, Streptococcus faecalis, S. faecium*
12-74 h, mean 18-36 h	Abdominal cramps, diarrhea, vomiting, fever, chills, malaise, nausea, headache, possible. Sometimes bloody or mucoid	*Salmonella* species (including *S. arizonae*), *Shigella*, enteropathogenic *Escherichia coli*, other *Enterobacteriacae, Vibrio*

	diarrhea, cutaneous lesions associated with V. vulnificus. Yersinia enterocolitica mimics flu and acute appendicitis.	*parahaemolyticus, Yersinia enterocolitica, Aeromonas hydrophila, Plesiomonas shigelloides, Campylobacter jejuni, Vibrio cholerae* (O1 and non-O1) *V.vulnificus, V. fluvialis*
3-5 days	Diarrhea, fever, vomiting abdominal pain, respiratory symptoms.	Enteric viruses
1-6 weeks	Mucoid diarrhea (fatty stools) abdominal pain, weight loss.	*Giardia lamblia*
1 to several weeks	Abdominal pain, diarrhea, constipation, headache, drowsiness, ulcers, variable -- often asymptomatic.	*Entamoeba histolytica*
3-6 months	Nervousness, insomnia, hunger pains, anorexia, weight loss, abdominal pain, sometimes gastroenteritis.	*Taenia saginata, T. solium*
Neurological symptoms (visual disturbances, vertigo, tingling, paralysis) occur		
Less than 1 h	*** SEE GASTROINTESTINAL AND/OR NEUROLOGIC SYMPTOMS (Shellfish Toxins) (this Appendix)	Shellfish toxin
	Gastroenteritis, nervousness, blurred vision, chest pain, cyanosis, twitching, convulsions.	Organic phosphate
	Excessive salivation, perspiration, gastroenteritis, irregular pulse, pupils constricted, asthmatic breathing.	Muscaria-type mushrooms
	Tingling and numbness, dizziness, pallor, gastro- hemmorrhage, and desquamation of skin, fixed eyes, loss of reflexes, twitching, paralysis.	Tetradon (tetrodotoxin) toxins
1-6 h	Tingling and numbness, gastroenteritis, dizziness, dry mouth, muscular aches, dilated pupils, blurred vision, paralysis.	Ciguatera toxin
	Nausea, vomiting, tingling, dizziness, weakness, anorexia, weight loss, confusion.	Chlorinated hydrocarbons
2 h to 6 days, usually 12-36 h	Vertigo, double or blurred vision, loss of reflex to light, difficulty in swallowing. speaking, and breathing, dry mouth, weakness, respiratory	*Clostridium botulinum* and its neurotoxins

	paralysis.	
More than 72 h	Numbness, weakness of legs, spastic paralysis, impairment of vision, blindness, coma.	Organic mercury
	Gastroenteritis, leg pain, ungainly high-stepping gait, foot and wrist drop.	Triorthocresyl phosphate
Allergic symptoms (facial flushing, itching) occur		
Less than 1 h	Headache, dizziness, nausea, vomiting, peppery taste, burning of throat, facial swelling and flushing, stomach pain, itching of skin.	Histamine (scombroid)
	Numbness around mouth, tingling sensation, flushing, dizziness, headache, nausea.	Monosodium glutamate
	Flushing, sensation of warmth, itching, abdominal pain, puffing of face and knees.	Nicotinic acid
Generalized infection symptoms (fever, chills, malaise, prostration, aches, swollen lymph nodes) occur		
4-28 days, mean 9 days	Gastroenteritis, fever, edema about eyes, perspiration, muscular pain, chills, prostration, labored breathing.	*Trichinella spiralis*
7-28 days, mean 14 days	Malaise, headache, fever, cough, nausea, vomiting, constipation, abdominal pain, chills, rose spots, bloody stools.	*Salmonella typhi*
10-13 days	Fever, headache, myalgia, rash.	*Toxoplasma gondii*
10-50 days, mean 25-30 days	Fever, malaise, lassitude, anorexia, nausea, abdominal pain, jaundice.	Etiological agent not yet isolated -- probably viral
Varying periods (depends on specific illness)	Fever, chills, head- or joint ache, prostration, malaise, swollen lymph nodes, and other specific symptoms of disease in question.	*Bacillus anthracis, Brucella melitensis, B. abortus, B. suis, Coxiella burnetii, Francisella tularensis, Listeria monocytogenes, Mycobacterium tuberculosis, Mycobacterium* species, *Pasteurella multocida, Streptobacillus moniliformis, Campylobacter jejuni, Leptospira* species.
Gastrointestinal and/or Neurologic Symptoms - (Shellfish Toxins)		
0.5 to 2 h	Tingling, burning, numbness,	Paralytic Shellfish Poisoning (PSP)

	drowsiness, incoherent speech, respiratory paralysis	(saxitoxins)
2-5 min to 3-4 h	Reversal of hot and cold sensation, tingling; numbness of lips, tongue & throat; muscle aches, dizziness, diarrhea, vomiting	Neurotoxic Shellfish Poisoning (NSP) (brevetoxins)
30 min to 2-3 h	Nausea, vomiting, diarrhea, abdominal pain, chills, fever	Diarrheic Shellfish Poisoning (DSP) (dinophysis toxin, okadaic acid, pectenotoxin, yessotoxin)
24 h (gastrointestinal) to 48 h (neurologic)	Vomiting, diarrhea, abdominal pain, confusion, memory loss, disorientation, seizure, coma	Amnesic Shellfish Poisoning (ASP) (domoic acid)

CDC: Instructions for Collecting Stool Specimens [1]

Instructions	Bacterial	Parasitic [2]	Viral [3]	Chemical
When to collect	During period of active diarrhea (preferably as soon as possible after onset of illness).	Anytime after onset of illness (preferably as soon as possible).	Within 48-72 hours after onset of illness.	Soon after onset of illness (preferably within 48 hours of exposure to contaminant).
How much to collect	Two rectal swabs or swabs of fresh stool from 10 ill persons; samples from 10 controls also can be submitted. Whole stool is preferred if non-bacterial stool testing considered	A fresh stool sample from 10 ill persons; samples from 10 controls also can be submitted. To enhance detection, 3 stool specimens per patient can be collected >48 hours apart.	As much stool sample as possible from 10 ill persons (a minimum of 10 mL of stool from each); samples also can be obtained from 10 controls.	A fresh urine sample (50 mL) from 10 ill persons; samples from 10 controls also can be submitted. Collect vomitus, if vomiting occurs within 12 hours of exposure. Collect 5-10 mL whole blood if a toxin/poison is suspected that is not excreted in urine.
Method for collection	For rectal swabs, moisten 2 swabs in an appropriate transport medium (e.g., Cary-Blair, Stuart, Amies; buffered glycerol-saline is suitable for E. coli, Salmonella, Shigella, and Y. enterocolitica but not for Campylobacter and Vibrio). Insert swab 1-1.5 inches into rectum and gently rotate. Place both swabs into the same tube deep enough that medium covers the cotton tips. Break off top portion of sticks and discard. Alternatively, swab whole stools and put them into Cary-Blair medium.	Collect bulk stool specimen, unmixed with urine, in a clean container. Place a portion of each stool sample into 10% formalin and polyvinyl alcohol preservative (PVA) at a ratio of one part stool to three parts preservative. Mix well. Save portion of the unpreserved stool placed into a leakproof container for antigen or PCR testing.	Place fresh stool specimens (liquid preferable), unmixed with urine, in clean, dry containers, e.g., urine specimen cups.	Collect urine, blood, or vomitus in prescreened containers *****. If prescreened containers are not available, submit field blanks with samples[†]. Most analyses from blood require separation of serum from red cells.Cyanide, lead and mercury analyses require whole blood collected in prescreened EDTA tubes. Volatile organic compounds require whole blood collected in a specially prepared gray-top tube.
Storage of specimens after collection	Refrigerate swabs in transport media at 4°C. When possible, test within 48 hours after collection; otherwise, freeze samples at -70°C. Refrigerate whole stool, process it within 2 hours after collection. Store portion of each stool specimen frozen at less than-15°C for antigen or PCR testing.	Store specimen in fixative at room temperature, or refrigerate unpreserved specimen at 4°C. A portion of unpreserved stool specimen may be frozen at less than -15°C for antigen or PCR testing.	Immediately refrigerate at 4°C. Store portion of each stool specimen frozen at less than -15°C for antigen or PCR testing.	Immediately refrigerate at 4°C and if possible freeze urine, serum, and vomitus specimens at less than -15°C. Refrigerate whole blood for volatile organic compounds and metals at 4°C.

Transportation	For refrigeration: Follow instructions for viral samples. For frozen samples: Place bagged and sealed samples on dry ice. Mail in insulated box by overnight mail.	For refrigeration: Follow instructions for viral samples. For room-temperature samples: Mail in waterproof container.	Keep refrigerated. Place bagged and sealed specimens on ice or with frozen refrigerant packs in an insulated box. Send by overnight mail. Send frozen specimens on dry ice for antigen or PCR testing.	Immediately refrigerate at 4°C and if possible freeze urine, serum, and vomitus specimens at less than -15°C. Refrigerate whole blood for volatile organic compounds and metals at 4°C. Place double bagged and sealed urine, serum, and vomitus specimens on dry ice. Mail in an insulated box by overnight mail. Ship whole blood in an insulated container with prefrozen ice packs. Avoid placing specimens directly on ice packs.

[1] Label each specimen in a waterproof manner, and put the samples in sealed, waterproof containers (i.e., plastic bags). Batch the collection and send in overnight mail to arrive at the testing laboratory on a weekday during business hours unless other arrangements have been made in advance with the testing laboratory. Contact the testing laboratory before shipping, and give the testing laboratory as much advance notice as possible so that testing can begin as soon as samples arrive. When etiology is unclear and syndrome is nonspecific, all 4 types of specimens may be appropriate to collect.

[2]For more detailed instructions on how to collect specimens for specific parasites, please go to http://www.dpd.cdc.gov/dpdx/

[3]For more detailed instructions on how to collect specimens for viral testing, please go to http://www.cdc.gov/mmwr/PDF/RR/RR5009.pdf

*The containers have been tested for the presence of the chemical of interest prior to use.

† Unused specimen collection containers that have been brought in to the field and subjected to the same field conditions as the used containers. These containers are then tested for trace amounts of the chemical of interest.

APPENDIX G
MISCELLANEOUS

The following is an example of an outbreak protocol developed by the Maricopa County Department of Public Health. This guideline utilizes much of the information from this manual but is much more specific to the county. Each county should develop their own specific protocol or guideline to follow if an outbreak were to occur.

The
Foodborne and Waterborne Illness
Outbreak Investigation Guide

"The FWBI Cookbook"

Prepared by the Maricopa County
Department of Public Health
Division of Disease Control
Office of Epidemiology and Data Services
March 2007, Final Edition

Introduction

Restaurant complaints? People sick at a nursing home? Illnesses among wedding guests? One wedding guest told us that "food poisoning (sic) is good luck at a wedding", but most wedding parties don't agree. Hence, it's up to us to investigate and make sure that the next wedding party isn't going to have the same "good luck." This guide should help you move through a foodborne or waterborne illness outbreak investigation.

Before you start, it's important to know what the purpose and goals of a foodborne or waterborne illness investigation are. A foodborne or waterborne illness investigation can:

- Most importantly, stop the spread of disease through education and information
- Identify the person, place, pathogen, and/or specific food that caused the outbreak
- Advise providers regarding medical care
- Enforce the health and food handling codes
- Take corrective action

What you can't provide with a foodborne or waterborne illness investigation is:

- Diagnose individual illnesses (unless specifically testing individuals)
- Provide treatment to patients

Keep these purposes in mind as you work on the investigation – it will help guide your activities.

This guide is a quick reference for conducting an epidemiologic foodborne or waterborne illness (FWBI) investigation. It is not intended to cover all aspects of an FWBI nor will it replace staff training on FWBI investigations. Please consult the following documents for further and more in-depth information:

- For information on disease symptoms, duration, etc., see most recent editions of:
    - *Control of Communicable Diseases Manual*
    - *The Red Book*
    - *CDC Case Definition Manual*
    - *Centers for Disease Control and Prevention (CDC) website*

- For detailed information on outbreak investigations, see most recent editions of:
    - *ADHS Infectious Disease Investigation Manual*
    - *PHIT Protocol*
    - *Procedures to Investigate Food Borne Illnesses* (International Association for Food Protection)

The guide should be used for *common source* foodborne illness investigations, in which a suspect exposure is presumably known – e.g., when several complaints come from the same

restaurant on the same date, when people become ill after one party or meeting, or when there are simultaneous illnesses at one facility. Different methods should be used for a *community exposure* outbreak, in which a number of people are ill with similar symptoms/lab results but there is no known common exposure that ties these people together.

In this guide we use a few symbols to designate different types of tasks:

- ☎ designates a communication step.
-  appears before epidemiological steps.
- ⌖ designates a point at which you need to make a decision.
- # precedes phone numbers. All are 602 area code unless otherwise noted.

Read on to start your investigation and *good luck*…

Checklist

Use this page as your checklist as you complete steps on the following pages.

☐	Step 1.	Enter name of investigation into the Summary of Outbreaks log
☐	Step 2.	Contact supervisor by phone or pager to alert her/him of possible outbreak
☐	Step 3.	Contact Environmental Services (ES) to get all information available
☐	Step 4.	Send Environmental Services to inspect site (if they haven't gone already)
☐	Step 5.	Call contact person from the outbreak to get more information
☐	Step 6.	If anyone has gone to a hospital or medical provider, contact the patient's medical provider and request information
☐	Step 7.	Fill out and submit CD3 form, if required
☐	Step 8.	Send e-mail to provide information on the outbreak and inform that ES has been dispatched to the site
☐	Step 9.	Continue to gather information on date, time, and location of the suspect exposure and name of contact person
☐	Step 10.	Call Foodborne/Enteric Disease Epidemiologist at ADHS
☐	Step 11.	Develop a working hypothesis of the cause and source of the outbreak
☐	Step 12.	Create a case definition (e.g., "diarrhea and/or vomiting")
	Step 13.	Call contact person and inform her/him that an inspector has been sent to the site
☐	Step 14.	Define the sample. Include both ill (cases) and not ill (controls)
☐	Step 15.	Modify the standard FWBI questionnaire
☐	Step 16.	Brief interviewers and give each a clear, unduplicated list of individuals to contact
☐	Step 17.	Interview ill employees
☐	Step 18.	Get stool specimens from employees who meet certain conditions
☐	Step 19.	Set-up a database for information obtained in the interviews
☐	Step 20.	Based on your hypothesis, identify lab tests you want performed
☐	Step 21.	Call ADHS to tell them which tests you would like done
	Step 22.	Complete paperwork for Arizona State Laboratory
☐	Step 23.	Deliver stool specimen kits to respondents who were ill (cases)
☐	Step 24.	Pick-up stool specimens and deliver to Arizona State Laboratory
☐	Step 25.	Create 2 x 2 tables for each food/drink item on the menu or for each possible exposure
☐	Step 26.	Notify individuals who submitted specimens of their lab results.
☐	Step 27.	Send follow-up/closure letter to contact person, facility
☐	Step 28.	Write summary form or report

Steps to a Great FWBI Outbreak Investigation

The Schu-ber-stew Axiom

Don't believe the first story you hear…it's almost always inaccurate.

The investigation begins when the Maricopa County Department of Public Health (MCDPH) receives notification of an outbreak from a member of the public, staff from a facility, a medical provider, or any other source. (See PHIT Protocol for full list of originators.)

- Step 1. Enter name of investigation into the electronic file called "Summary of Outbreaks" (G:/EPI/New Surveillance/Outbreaks/Outbreak Multi Year Log/Summary of Outbreaks). The investigation should be named after the facility or restaurant in which the suspect exposure took place and the month/year in which the exposure took place (e.g., Mare's Bistro Jan 05). Be sure to update this log every few steps so that others can check the log, monitor the progress of the investigation, and/or track cases in other databases.

- Step 2. Contact supervisor by phone or pager to alert her/him of possible outbreak.

- Step 3. Contact Environmental Services (ES) to get all information available from them (#Korissa Entringer 506.6982 or #Tesann Achilles 506.5359 or #Jaime Viñarás 506-6929). After hours, call the ES Complaint Line at # 506.6616 and follow the instructions for contacting the on-call person. (It will require you to leave a message and someone will return your call in 10-20 minutes.) Review all interviews conducted by ES, if any.

- Step 4. Consult with ES on whether or nor an inspection is necessary. If it is, send ES to inspect site (many times they will already be planning the inspection or will have already completed an inspection). They have a standard protocol for environmental investigations, but need to remind them to:

    - Collect menus from any suspect meal(s)
    - Identify ill employees who may have handled or prepared the suspect meal Review employee payroll logs to see if any employees were absent before or after the suspect exposure
    - Collect samples of any food leftover from the suspect meal
    - Collect samples of any food that is related to a violation (e.g.,, beans not cooled properly).

- Step 5. Call contact person from the outbreak (usually the person who organized the event or a

The Media

It is important not to give any information to the media at any point in your investigation. If there are any requests from the media, work with the Public Information Officer (#Jeanene Fowler-DeRepentigny 506.4926) and your supervisor.

staff member from a facility) to gather as much information as possible on the following:

- Number of people ill, recovered
- Number of hospitalizations, deaths, visits to providers
- Number of people exposed (number at the event, if applicable)
- Location of suspect exposure
- Date and time of suspect exposure
- Menu of suspect exposure
- Onset date(s)
- Symptomatology
- Names and phone numbers and/or e-mail addresses of both sick and well participants

This may take more than one phone call and you may have to make arrangements for the contact person to call/fax/e-mail you back with some of the information when it is available. Please be aware that confidential information such as case names and phone numbers should not be sent out over email. Be sure to remind contact person that exposed persons should wash hands after using the bathroom and before handling food. They should contact their medical providers if they feel ill enough. People experiencing gastrointestinal symptoms (such as vomiting, diarrhea) should drink plenty of fluids.

A Note on Confidentiality

Remember that the symptoms and names of people you are interviewing must be kept confidential. Unlike other information that may fall under public information laws, no one has a right to this information. On very rare occasions we receive a subpoena. If this happens, see your supervisor.

- Step 5. If anyone has gone to a hospital or medical provider, contact the patient's medical provider and request that lab results or specimens be sent to the Arizona State Laboratory (ASL). Call the hospital or private laboratory directly to make arrangements before specimens are destroyed. Notification that specimens are arriving can be sent via SIREN email if available or call Foodborne/Enteric Disease Epidemiologist (#Joli Weiss 364.3675) at Arizona Department of Health Services (ADHS) to alert her that samples and specimens may be arriving. If you anticipate samples/specimens being submitted after hours or on the weekend, make arrangements now.

- Decision: To determine the urgency of an investigation, please see *Appendix A: Should I Give Up My Weekend?*

Let's Get Serious

If at any point in the investigation, you suspect or learn that the outbreak is a rare or serious disease (e.g., botulism), please see a supervisor and consult the Epi On-Call Manual for next steps. If you can't find a supervisor or you aren't in the office, call the #Epi Pager at 420.2839. Enter your phone number followed by the "#" sign and one of the team leaders will call you back. Or, you can call the doctor on-call at 339-8749.

Step 7. Fill out and submit CD3 form, if required by Environmental Services. (This form is needed when we request an environmental investigation that otherwise would not be conducted. An electronic copy of this from can be found here: G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\CD3)

☎ Step 8. Send e-mail to provide information on the outbreak and inform that ES has been dispatched to the site. See Appendix B for a list of staff members to contact.

Step 9. Continue to gather information on, minimally, the date, time, and location of the suspect exposure and name of contact person.

⌖ Decision: If number of reported ill is less than five persons, all ill persons have been interviewed by ES, and there are no hospitalizations or deaths (confirmed by contact person), then consult with supervisor about possibly closing the investigation.

Reading Between the Lines

A few tips on doing a great literature search:

- *Good sources for information: PubMed, Medscape, cdc.gov*
- *Follow the thread – note authors referenced in peer-reviewed journals and search for these authors*
- *Search by possible sources, recent investigations, incubation periods, etc.*
- *Search by vulnerable group or facility, if appropriate (e.g., day care center, jail)*

☎ Step 10. Call Foodborne/Enteric Disease Epidemiologist (#Joli Weiss 364.3675), to alert her that food samples and stool specimens are being delivered to ASL, if applicable. Again, make arrangements now for after-hours or weekend drop-off.

Step 11. Develop a working hypothesis of the cause and source of the outbreak. Consult the *Infectious Disease Investigation Manual* (Foodborne/Waterborne Section, page 3) for possible pathogens that are consistent with the symptoms, onsets, and incubation periods of the outbreak patients.

You're an Epidemiologist, Not a Cop

Although it's very rare, a food or waterborne illness outbreak could be caused intentionally. Although you may watch a lot of "CSI", you're not qualified to conduct a criminal investigation. So, if you suspect foul play or if a law enforcement officer contacts you, please see your supervisor.

⌖ This may require conducting a literature search and/or a review of past outbreaks in Maricopa County. Conduct a literature search if any of the following conditions exists: you suspect an unusual disease (e.g., scombroid fish poisoning), there is an unusual presentation, there is no experience among MCDPH staff with this type of outbreak/disease, the venue or affected group is unusual. If this is time consuming, ask your supervisor to find another staff member to complete this task.

Step 12. Create a case definition (e.g., "diarrhea and/or vomiting") based on the information

gathered thus far. Use the *CDC Case Definition Manual* for help.

☎ Step 13. Call contact person and inform her/him that an inspector has been sent to the facility. If interviewing will be done, inform person that this is occurring and mention that we may ask for stool specimens from interview respondents.

Step 14. Define the sample. The sample should include both cases (people who were ill) and controls (people who were not ill).

If the location of the exposure was a restaurant, you should interview both cases (people who complained of becoming ill) and other members of their party. You do not need to seek out additional controls from among the other restaurant patrons. The only exception is if there have been ongoing complaints over time for the same restaurant. In this case, you will need to get information (e.g., names) from receipts and attempt to call other patrons.

You're an Epidemiologist, Not a Lawyer

Some of the victims of a FWBI investigation are ready to sue because their event was ruined. They are going to want you to provide conclusive evidence of who is to blame. Even though you watch a lot of "Law and Order", *you're not an attorney.*

If talk of a lawsuit is present, you must conduct the investigation exactly as you would if there were no lawsuit. When your report is finished, it is available to the public, including attorneys, the media, etc.

Step 15. Modify the standard FWBI questionnaire. This can be found at G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\Outbreak Form Folder\Final Outbreak Questionnaire. In the section about food history, insert items from the menu obtained in Step 3. Add any questions that you feel are related to the outbreak. For example, for a wedding you may ask, "Were ill participants of the wedding spending time together before the wedding?" Make sure that the interview includes a question on whether or not the respondent will be willing to provide a stool specimen. If possible, interviews should be completed electronically. Currently a new system for electronic questionnaires is being developed. This section will be updated as information on the new system becomes available.

⌖ Decision: In some cases, you will not be able to interview all individuals yourself. If there are more than 10 individuals, you should see a supervisor who can help you recruit additional interviewers.

☎ Step 16. (Note: If you are working on your own and don't have additional interviewers, complete Step 18 here, then come back to Step 16 and 17.) Meet briefly with interviewers to share all information you have so far. Make sure they have paper copies of or electronic access to questionnaire. Interviewers should be briefed on:

- Nature of outbreak (how many ill, event, etc.)

- Your working hypothesis of the cause of the outbreak and any other important information related to the outbreak
- Names to be contacted with contact information
- What to do with questionnaires when completed
- How to complete questionnaire
- Contact information to leave if respondent is not at home
- It is also a good idea for you to find out when the interviewer is available to make calls, what her/his schedule is, etc. so you can plan ahead
- Information on specimen collection
- Health education (e.g., handwashing)

The Golden Triangle

The golden triangle of foodborne illness investigations includes the following foods:

- *Pizza*
- *Buffets*
- *Chinese food*

It is particularly difficult to determine a cause of an outbreak when dealing with these foods because the foods are often mixed with each other or eaten in combinations.

Give each interviewer a clear, unduplicated list of individuals to contact. Each interviewer's list should be a combination of ill and not ill persons alternating between the two groups. If you ask nicely, ADHS will handle individuals who a) left town and are not Maricopa County residents, or b) are residents of Indian reservations. When briefing is completed, interviewers should begin immediately.

- Step 17. Ask ES for the names of all ill employees, if they have not provided this already. Add these names to the list of people to be interviewed.

- Step 18. Get stool specimens from employees who meet one or more of these conditions:

  - Any employee who was ill at any time within 1-2 weeks before or 1-2 weeks after the suspect exposure date and had symptoms similar to the symptoms of the complainants. (If your case definition is vomiting and diarrhea, an employee with respiratory symptoms only would *not* need to submit a specimen.) The amount of time before/after the exposure date should be determined by the incubation period that is consistent with your working hypothesis.
  - In a restaurant with persistent, ongoing complaints (more than one exposure date), all employees must submit stool specimens.

If employees meeting one or more of these criteria refuse to provide samples, they may be compelled by regulation to do so (see box, below).

ES and MCDPH may exclude any restaurant employee from work who "has or demonstrates any illness or

Contents of a stool specimen kit:

- *Large plastic receptacle ("a hat")*
- *Instructions*
- *Plastic spoon*
- *Biohazard bag*
- *Small plastic container*

Kits are in the credenza in the file room along with instructions for assembly.

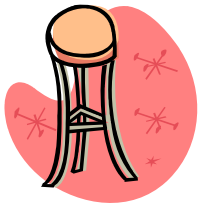
symptoms of a communicable disease that may be transmitted through food." If you feel that this description applies to any employees (either from interview or specimen results), work with ES and your supervisor to address.

- Step 19. Set-up a database for information obtained in the interviews. A basic shell (in Excel) can be found in a file named "FWBI Database Template" in G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\Outbreak Form Folder. This has column headings that coordinate with the generic FWBI questionnaire. As interviews are being completed, enter answers into database (1=yes, 0=no, 9=unknown). If you have more than 20 respondents, ask your supervisor if this task should be delegated to someone else. Please note that in many cases interviews will be conducted electronically, therefore no additional database needs to be created.

- Step 20. Based on your hypothesis, identify lab tests you want performed on stool specimens and/or any special tests (other than ES's regular tests) you want performed on food samples. (Please note that the Lab will not "check for everything".)

- ☎ Step 21. Call Foodborne/Enteric Disease Epidemiologist (#Joli Weiss 364.3675) and consult with her on which tests are applicable. Be sure to get information on how specimens should be collected and handled in order for the tests to be successful (e.g., refrigeration).

- Step 22. Complete paperwork for Arizona State Laboratory. Paperwork may be found in the credenza in the file room.



Compelling the Stool

According to the Maricopa County Environmental Health Code, Chapter VII, Regulation 6, if we suspect that a food service worker (FSW) may be "a carrier of or infected with a communicable disease which can be transmitted to the public, through food," we can "(1) Examine or cause the examination of the FSW, and (2) secure from the FSW or Food Service Manager appropriate specimens or fluids of body discharge."

- Step 23. Deliver stool specimen kits to cases who volunteered during the interviews. (If possible, arrange to have the courier do it.) The instructions for people providing stool specimens may be found in a file named "FBI Stool Instructions" in G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\Outbreak Form Folder. Be sure to alter the instructions to include the donor's name and the contact information the donor should use when the specimen is ready. Also be sure to label the specimen containers with the donor's name and DOB. The courier is available to pickup and drop off kits and stool specimens. The courier company is S&S Express (# Scott 602-820-3022 fax 623-322-5195 or online at http://www.dwaybill.com/s-s-express (Customer Number: Maricopa Password: 1234))

- Step 24. Pick up stool specimens from respondents when ready. Deliver specimens and paperwork to Arizona State Laboratory at 250 N. 17th Avenue (# 542.1190). IF the courier is delivering specimens, fax the paperwork to receiving (#364-0758). You must

also call (or SIREN email) the Foodborne/Enteric Disease Epidemiologist at ADHS (# Joli Weiss 364.3675), and tell her that you have delivered specimens to the Lab. They will help to shepherd the specimens through the system. The Lab operates seven days/week, 8:00 a.m. to 5:00 p.m. In almost all cases, if you get a specimen at night, you can store the specimen until the next morning. In the unusual event that you need to deliver a sample after-hours, call #591.8683. Specimens requiring refrigeration should be transported in a cooler with an icepack and stored in the specimen refrigerator at 4041.

Kids are Alright

When you're dealing with anyone under the age of 18, you must speak with the parents. You should ask all questions of the parents only, unless the parent directly refers you to the child. For older kids, you may get more information from the child than the parent, but do this only if the parent permits.

Step 25. When at least 15 questionnaires are entered into database, create 2 x 2 tables for each food/drink item on the menu or for each possible exposure. You can use EpiInfo, SPSS, or SAS for this. In most cases, you will need to repeat this step at least once (or several times) as you complete more interviews.

Decision: The tables will show if any one or more food item was more likely to be eaten by the people who became ill. If you get a table that shows statistical significance (at the .05 level) for one or more items, meet with supervisor to consider stopping the investigation. You will need to continue the process until you a) have a statistically significant result, b) interview all individuals present at the suspect event, or c) reach the minimum sample size as determined by EpiInfo (large groups only).

Step 26. Notify individuals who submitted specimens of their lab results. These results may only be released to the individual her/himself and not to anyone else. If the specimen belongs to a person under the age of 18, results must go to the parents only.

Decision: If the results of the lab test on stool specimens show a pathogen that was also identified in a lab test of a food specimen, you may stop the investigation.

Step 27. Send follow-up/closure letter to contact person, facility. Thank them for help and tell them when report will be available.

Step 28. Write summary form or report and give to Surveillance Team Leader for review. Sample reports may be found in the G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\Outbreak Form Folder. Send report to contact person and facility.

You're done!

Appendix A: Should I Give Up My Weekend?

You may use the following factors to determine the urgency of an outbreak. The more items that are present and the more severe each item, the more urgent the investigation. These factors are listed in order of priority.

1. Presence of hospitalizations or death(s)
2. Disease characteristics suggest a serious disease
3. Large number of people ill
4. Percent of people who are still ill vs. percent who are recovered
5. High percentage of people at event who were ill (attack rate)
6. Location is likely to promote further disease spread, e.g., jail, child care center (nature and type of location where exposure occurred)
7. Affected group is particularly vulnerable (e.g., hospital patients, seniors)
8. Presence of secondary spread
9. Short time since exposure
10. Intense media and/or public attention

After taking these factors into account, you will also need to consider the resources you have available for completing a new investigation:

- Number of outbreaks currently under investigation
- Number of staff available to assist with outbreak

Appendix B: List of People to Keep Informed About an Outbreak (E-mail)

Area	Individuals to be contacted:
Maricopa County Department of Public Health	
Epidemiology and Data Services	Sarah Santana, Vjollca Berisha, Jennifer Stewart, Abrium Escarzaga, Tammy Sylvester, Liva Nohre, Mare Schumacher, Purvi Patel
Medical Director	Bob England
Public Health Emergency Mngmt	Alisa Diggs
Public Information Officer	Jeanene Fowler-De Repentigny
Community Health Nursing	Ron Klein, Machrina Leach, Sun Wright, Telly Der, Karen Rose, Rachel De la Huerta
Maricopa County Environmental Services	Korissa Entringer, Tesann Achilles, David Ludwig,
Arizona Department of Health Services	Joli Weiss, Shoana Anderson, Aarikha D'Sousa

Poison Control needs to be included only if it is a Friday. They handle calls received over the weekend.

Appendix C: Outbreak Intake Form

This form can be found electronically here: G:\EPI\New Surveillance\Outbreaks\Outbreak Forms and Templates\Outbreak Form Folder

Outbreak Intake Form

This form is to be used to collect information on first receipt of an outbreak report.

15. Facility name _____
16. Facility type _____
17. Contact Person _____ Phone _____
    Job Title_____ Fax _____
18. Event type (wedding, meal, etc) if applicable _____
    _____
19. Meal or event date _____
20. Number Ill _____
21. Total at event or facility (be sure to include #s in various areas such as in assisted living section and skilled nursing section)
    _____
22. Total number of staff _____
23. Date of first onset _____
24. Incubation period _____
25. Date of last onset or ongoing _____
26. Duration _____
27. Hospitalizations (yes/no) _____
    a. If yes, how many _____
    b. Where _____
28. Deaths (yes/no) _____
    a. If yes, how many _____

Notes: _____

_____

_____

Appendix D: What kind of kit should I send out?

What type of specimen kit to send out (norovirus only versus norovirus plus bacterial enteric culture) depends on the characteristics of the illness exhibited by cases. The following table should offer general guidelines on the type of kit to send for a given outbreak.

Illness Characteristic	Kit Type
Incubation <12 hours	Bacterial only
Incubation 12-24 hours	Norovirus only
Incubation 24-48 hours	Both
Any case with bloody diarrhea	Both

Appendix E: Protocol for gastrointestinal outbreak investigations at skilled nursing facilities, nursing homes, assisted living or independent living facilities

For the purpose of outbreak investigations these facilities will be grouped into three categories:

1) skilled nursing facility (SNF), hospital based skilled nursing facilities or extended care facilities, intermediate care facilities (ICF)
2) nursing home, custodial care facilities (CCF)
3) assisted living, independent living and senior apartment

Definitions:
Skilled nursing facility (SNF), hospital based SNF, and ICF ~ these facilities generally include 24 hour monitoring and some level of medical care, are typically short-term and for people recovering from acute illness and injury although ICF's cater to long-term residents with chronic illness.

Nursing home, custodial care facility ~ generally long-term bed and board, 24-hour assistance with custodial care.

Assisted living, independent living, and senior apartments ~ residential community, residents are ambulatory, may have meals or on-site dining, laundry, housekeeping, social activities and transportation provided.

Investigation steps:
For categories 1 & 2, determine if there really is an outbreak and follow the steps as outlined on page 3 of the Cookbook (excluding steps involving interviews). In addition consider the following:

- ✓ Automatically dispatch Environmental Services to an outbreak at a facility falling into one of these categories.
- ✓ Nursing or medical staff are typically present in these facilities; utilize their assistance in obtaining stool specimens and line lists.
- ✓ Check on numbers of ill residents by area or type of patient (independent vs. dementia, etc).

- ✓ No interviews or related analysis necessary.

For category 3, determine if there really is an outbreak; consider how reliable the initial counts are in your decision. Additional follow-up may be necessary to get a firm count. Additional steps for this category include:

- ✓ Obtain a line list of ill residents and conduct exploratory interviews with these residents using the standard outbreak questionnaire.
- ✓ Inquire about common activities or outings.
- ✓ Inquire about ill staff, including kitchen staff.
- ✓ If no residents in the emergency room and no other ill residents identified during exploratory interviews, check-in can wait until the morning.
- ✓ Request that facility question residents about gastrointestinal symptoms at check-in during meals and/or evening check-in.
- ✓ Discuss situation with Environmental Services (ES), indicate whether Epi is requesting an inspection to a) rule out the kitchen in the outbreak or b) if it is a general inspection.
- ✓ ES continued ~ inquire as to last inspection date and results, request an email containing reasons for going out to inspect facility or not, indicate to ES whether or not interviews will be conducted by Epi before their inspection.

Appendix F: Protocol for investigation of respiratory (ILI) outbreaks in schools

This protocol is intended to deal with outbreaks in schools of non-specific respiratory illness, sometimes with fever. The outbreaks may sometimes meet the requirements for influenza-like illness (ILI) depending on exact symptoms. This protocol is not intended as influenza surveillance but as a way to handle large outbreaks of non-specific illness in schools. Line lists will not be requested in most instances, and Environmental Services will not be dispatched to inspect the schools. Unless otherwise noted, all steps are to be performed by the Outbreak Investigation Team.

1. Get preliminary information from school, including number of absences (preferably broken out by symptoms), total number of students in school, absenteeism rate before outbreak, hospitalizations, deaths, and any known diagnoses (e.g. one child diagnosed by own provider as having strep throat).

2. Determine whether or not the following criteria are associated with this outbreak (Epi Outbreak Team):

a. Death related to the respiratory illness

b. Extended hospital stay related to the respiratory illness (not for another reason such as accident, surgery, or other illness)

c. A level of absenteeism that is extremely high (by judgment) compared to either the school's own baseline and/or the absentee data we collect from schools in the influenza

report (Please note that eventually data should be available from the ADHS CHIP program to enable an estimate of baseline ILI rates for schools. Once this data is available it will be used.)

d. Provider/lab confirmed identification of a reportable disease

3. If none of the criteria above exists, complete the following two steps:

a. Fax/email a letter to the school that includes:

i. Get flu vaccine

ii. Hand washing, environmental hygiene

iii. Exclusion of ill students and staff

iv. Join the sentinel flu sites (forms attached to letter)

v. Other prevention items from the CDC and other sources

vi. Events to watch for that should inspire schools to call us if they happen (death, serious illness, very high absenteeism, reportable disease)

vii. Attach appropriate handouts from CDC, elsewhere that provide information above and beyond the letter content.

b. Complete outbreak report form for workload counting purposes.

4. If one or more of the criteria in Step 2 are met, follow protocols for appropriate reportable disease, if identified (CHN or Epi depending on disease) or apply appropriate steps in *Foodborne/Waterborne Illness Outbreak Cookbook*.

Appendix G: Protocol for the investigation of varicella outbreaks in schools

This addendum to the Cookbook applies to varicella (chickenpox) outbreaks reported by schools. For information on ILI or GI outbreaks occurring in schools see the respective protocols in the appendices to the Cookbook.

Definitions:
An outbreak of varicella is defined as two or more cases occurring within one incubation period (21 days) of each other.

Investigation steps:

Outbreaks could be reported directly by the school nurse or identified from varicella report forms during data entry into the CDR. The first step is to contact the school nurse and obtain more information. Additional steps include:

- ✓ If report forms for each case have not been submitted, then request reports using the varicella specific mini-CDR form. If the nurse does not have this form, then provide him/her with the form.
- ✓ Remind school nurse that all students with varicella should be excluded promptly from school until all lesions have dried and crusted.
- ✓ Offer educational materials. (Educational materials can be found here: G:\EPI\New Surveillance\Outbreaks\Outbreak Educational Material\Disease Specific)
- ✓ If the school nurse has not already done so, then request that a letter be sent home to parents notifying them of the outbreak. If all cases are confined to one grade then letters targeted to one group (e.g. second graders) are acceptable.
- ✓ The school nurse should make phone contact with parents of students who have never been immunized against varicella to recommend vaccination and notify them of the outbreak.
- ✓ At this time, MCDPH does not recommend exclusion of non-immune children from school unless they develop symptoms of varicella.
- ✓ Have the school nurse recommend a second dose of varicella vaccine to those students who have had only one dose. A second dose recommendation should be included in the letter.
- ✓ It is important that the school nurse notify all staff members, especially staff members who are or could be pregnant, of the outbreak immediately.
- ✓ Follow-up with the school nurse for the duration of the outbreak. The outbreak is considered over when no new cases have been reported in the school for a full incubation period (21 days).

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