

# Diagnosis and Management of Foodborne Illnesses

A Primer for Physicians  
and Other Health Care Professionals

## Introduction and Clinical Considerations

American Medical Association  
American Nurses Association-American Nurses Foundation  
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This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the Centers for Disease Control and Prevention (CDC), the Food Safety and Inspection Services, US Department of Agriculture, and the Center for Food Safety and Applied Nutrition, Food and Drug Administration. The CDC is accredited by the ACCME to provide continuing medical education for physicians.

CDC designates this educational activity for a maximum of 2.75 hours in category 1 credit towards the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

## Preface

Foodborne illness is a serious public health problem. The Centers for Disease Control and Prevention (CDC) estimates that each year 76 million people get sick, more than 300,000 are hospitalized, and 5,000 die as a result of foodborne illnesses. Primarily the very young, the elderly, and the immunocompromised are affected. Recent changes in human demographics and food preferences, changes in food production and distribution systems, microbial adaptation, and lack of support for public health resources and infrastructure, have led to the emergence of novel as well as traditional foodborne diseases. With increasing travel and trade opportunities, it is not surprising that now there is a greater risk of contracting and spreading a foodborne illness locally, regionally, and even globally.

Physicians and other health care professionals have a critical role in the prevention and control of food-related disease outbreaks. This primer is intended to provide practical and concise information on the diagnosis, treatment, and reporting of foodborne illnesses. It was developed collaboratively by the American Medical Association, the American Nurses Association-American Nurses Foundation, the Centers for Disease Control and Prevention, the Food and Drug Administration's Center for Food Safety and Applied Nutrition, and the United States Department of Agriculture's Food Safety and Inspection Service.

We encourage you to review this information and participate in the attached continuing medical education (CME) program. Even if you choose not to participate in the CME component, please take time to complete and return the **Program Evaluation Form**. Your feedback is valuable for updating this primer and for planning future physician and other health care professional education programs.

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## Background

This primer is directed to primary care and emergency physicians, who are likely to see the index case of a potential food-related disease outbreak. It is also a teaching tool to update physicians and other health care professionals about foodborne illness and remind them of their important role in recognizing suspicious symptoms, disease clusters, and etiologic agents, and reporting cases of foodborne illness to public health authorities.

Specifically, this guide urges physicians and other health care professionals to:

- Recognize the potential for a foodborne etiology in a patient's illness;
- Realize that many but not all cases of foodborne illness have gastrointestinal tract symptoms;
- Obtain stool cultures in appropriate settings, and recognize that testing for some specific pathogens, eg, *E. coli* O157:H7, *Vibrio* spp., must be requested;
- Report suspect cases to appropriate public health officials;
- Talk with patients about ways to prevent food-related diseases; and
- Appreciate that any patient with foodborne illness may represent the sentinel case of a more widespread outbreak.

Foodborne illness is considered to be any illness that is related to food ingestion; gastrointestinal tract symptoms are the most common clinical manifestations of foodborne illnesses. This document provides detailed summary tables and charts, references, and resources for health care professionals. Patient scenarios and clinical vignettes are included for self-evaluation and to reinforce information presented in this primer. Also included is a CME component worth 2.75 credit hours.

This primer is not a clinical guideline or definitive resource for the diagnosis and treatment of foodborne illness. Safe food handling practices and technologies (eg, irradiation, food processing and storage) also are not addressed. More detailed information on these topics is available in the references and resources listed in this document, as well as from medical specialists and medical specialty societies, state and local public health authorities, and federal government agencies.

# Clinical Considerations

**F**ood-related disease threats are numerous and varied, involving biological and nonbiological agents. Foodborne illnesses can be caused by microorganisms and their toxins, marine organisms and their toxins, fungi and their related toxins, and chemical contaminants. During the last 20 years, some foods that have been linked to outbreaks include milk (*Campylobacter*); shellfish (noroviruses); unpasteurized apple cider (*Escherichia coli* O157:H7), raw and undercooked eggs (*Salmonella*); fish (ciguatera poisoning); raspberries (*Cyclospora*); green onions (hepatitis A virus); and ready-to-eat meats (*Listeria*).

While physicians and other health care professionals have a critical role in surveillance for and prevention of potential disease outbreaks, only a fraction of the people who experience gastrointestinal tract symptoms from foodborne illness seek medical care. In those who do seek care and submit specimens, bacteria are more likely than other pathogens to be identified as causative agents. Bacterial agents most often identified in patients with foodborne illness in the United States are *Campylobacter*, *Salmonella*, and *Shigella* species, with substantial variation occurring by geographic area and season. Testing for viral etiologies of diarrheal disease is rarely done in clinical practice, but viruses are considered the most common cause of foodborne illness.

This section and the accompanying **Foodborne Illnesses Tables** summarize diagnostic features and laboratory testing for bacterial, viral, parasitic, and noninfectious causes of foodborne illness. For more specific guidance, consult an appropriate medical specialist or medical specialty society, as well as the various resources listed in this primer. Also refer to this section and the accompanying **Foodborne Illnesses Tables** when working through the various **Patient Scenarios** and the **Clinical Vignettes** portion of this primer.

## Recognizing Foodborne Illnesses

Patients with foodborne illnesses typically present with gastrointestinal tract symptoms (eg, vomiting, diarrhea, abdominal pain); however, nonspecific symptoms and neurologic symptoms may also occur. Every



outbreak begins with an index patient who may not be severely ill. A physician or health care professional who encounters this person may be the only one with the opportunity to make an early and expeditious diagnosis. Thus, the physician or health care professional must have a high degree of suspicion and ask appropriate questions to recognize that an illness may have a foodborne etiology.

Important clues to determining the etiology of a foodborne disease are the:

- Incubation period;
- Duration of the resultant illness;
- Predominant clinical symptoms; and
- Population involved in the outbreak.

Additional clues may be derived by asking whether the patient has consumed raw or poorly cooked foods (eg, raw or undercooked eggs, meats, shellfish, fish), unpasteurized milk or juices, home-canned goods, fresh produce, or soft cheeses made from unpasteurized milk. Inquire as to whether any of the patient's family members or close friends have similar symptoms. Inquiries about living on or visiting a farm, pet contact, day care attendance, occupation, foreign travel, travel to coastal areas, camping excursions to mountains or other areas where untreated water is consumed, and attendance at group picnics or similar outings also may provide clues for determining the etiology of the illness.

If a foodborne illness is suspected, submit appropriate specimens for laboratory testing and contact the state or local health department for advice about epidemiologic investigation. For the physician or other health care professional, implication of a specific source in disease transmission is difficult from a single patient encounter. Attempts to identify the source of the outbreak are best left to public health authorities.

Because infectious diarrhea can be contagious and is easily spread, rapid and definitive identification of an etiologic agent may help control a disease outbreak. Early identification of a case of foodborne illness can prevent further exposures. An individual physician who obtains testing can contribute the clue that ultimately leads to identification of the source of an outbreak.

Finally, health care professionals should recognize that while deliberate contamination of food is a rare event, it has been documented in the past. In the current post-September 11 environment, the following events may suggest that intentional contamination has occurred: an unusual agent or pathogen in a common food, a common agent or pathogen affecting an unusually large number of people, or a common agent or pathogen that is uncommonly seen in clinical practice.

## Diagnosing Foodborne Illnesses

### Differential Diagnosis

As shown in Table 1 and the **Foodborne Illnesses Tables**, a variety of infectious and noninfectious agents should be considered in patients suspected of having a foodborne illness. However, establishing a diagnosis can be difficult, particularly in patients with persistent or chronic diarrhea, those with severe abdominal pain, and when there is an underlying disease process. The extent of diagnostic evaluation depends on the clinical picture, the differential diagnosis considered, and clinical judgment.

The presentation of a patient with a foodborne illness is often only slightly different from that of a patient who presents with a viral syndrome. In addition, viral syndromes are so common that it is reasonable to assume that a percentage of those diagnosed with a viral syndrome have actually contracted a foodborne illness. Therefore, the viral syndrome must be excluded in order to suspect the foodborne illness and take appropriate public health action. Fever, diarrhea, and abdominal cramps can be present or absent in both cases so they are not very helpful. The absence of myalgias or arthralgias would make a viral syndrome less likely and a foodborne illness (that does not target the neurologic system) more likely. Foodborne illnesses that do target the neurologic system tend to cause paresthesias, weakness and paralysis that are distinguishable from myalgias or arthralgias (see below). The presence of dysentery (bloody diarrhea) is also more indicative of a foodborne illness, particularly if it is early in the course.

If any of the following signs and symptoms occur in patients, either alone or in combination, laboratory testing may provide important diagnostic clues (particular attention should be given to very young and

elderly patients and to immunocompromised patients, all of whom are more vulnerable):

- Bloody diarrhea
- Weight loss
- Diarrhea leading to dehydration
- Fever
- Prolonged diarrhea (3 or more unformed stools per day, persisting several days)
- Neurologic involvement, such as paresthesias, motor weakness, cranial nerve palsies
- Sudden onset of nausea, vomiting, diarrhea
- Severe abdominal pain

In addition to foodborne causes, a differential diagnosis of gastrointestinal tract disease should include underlying medical conditions such as irritable bowel syndrome; inflammatory bowel diseases such as Crohn's disease or ulcerative colitis; malignancy; medication use (including antibiotic-related *Clostridium difficile* toxin colitis); gastrointestinal tract surgery or radiation; malabsorption syndromes; immune deficiencies; and numerous other structural, functional, and metabolic etiologies. Consideration also should be given to exogenous factors such as the association of the illness with travel, occupation, emotional stress, sexual habits, exposure to other ill persons, recent hospitalization, child care center attendance, and nursing home residence.

The differential diagnosis of patients presenting with neurologic symptoms due to a foodborne illness is also complex. Possible food-related causes to consider include recent ingestion of contaminated seafood, mushroom poisoning, and chemical poisoning. Because the ingestion of certain toxins (eg, botulinum toxin, tetrodotoxin) and chemicals (eg, organophosphates) can be life-threatening, a differential diagnosis must be made quickly with concern for aggressive therapy and life support measures (eg, respiratory support, administration of antitoxin or atropine), and possible hospital admission.

**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, <i>Staphylococcus aureus</i> toxin, <i>Bacillus cereus</i> toxin) and heavy metals.
Noninflammatory diarrhea (acute watery diarrhea without fever/dysentery; some patients may present with fever) <sup>1</sup>	Can be caused by virtually all enteric pathogens (bacterial, viral, parasitic) but is a classic symptom of: Enterotoxigenic <i>Escherichia coli</i> <i>Giardia</i> <i>Vibrio cholerae</i> Enteric viruses (astroviruses, noroviruses and other caliciviruses, enteric adenovirus, rotavirus) <i>Cryptosporidium</i> <i>Cyclospora cayetanensis</i>
Inflammatory diarrhea (invasive gastroenteritis; grossly bloody stool and fever may be present) <sup>2</sup>	<i>Shigella</i> species <i>Campylobacter</i> species <i>Salmonella</i> species Enteroinvasive <i>E. coli</i> Enterohemorrhagic <i>E. coli</i> <i>E. coli</i> O157:H7 <i>Vibrio parahaemolyticus</i> <i>Yersinia enterocolitica</i> <i>Entamoeba histolytica</i>
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 <i>Cyclospora cayetanensis</i> , <i>Cryptosporidium</i> , <i>Entamoeba histolytica</i> , and <i>Giardia lamblia</i> .

Clinical Presentation	Potential Food-Related Agents to Consider
Neurologic manifestations (eg, paresthesias, respiratory depression, bronchospasm, cranial nerve palsies)	Botulism ( <i>Clostridium botulinum</i> toxin) Organophosphate pesticides Thallium poisoning Scombroid fish poisoning (histamine, saurine) Ciguatera fish poisoning (ciguatoxin) Tetradon fish poisoning (tetrodotoxin) Neurotoxic shellfish poisoning (brevetoxin) Paralytic shellfish poisoning (saxitoxin) Amnesic shellfish poisoning (domoic acid) Mushroom poisoning Guillain-Barre syndrome (associated with infectious diarrhea due to <i>Campylobacter jejuni</i> )
Systemic illness (eg, fever, weakness, arthritis, jaundice)	<i>Listeria monocytogenes</i> <i>Brucella</i> species <i>Trichinella spiralis</i> <i>Toxoplasma gondii</i> <i>Vibrio vulnificus</i> Hepatitis A and E viruses <i>Salmonella</i> Typhi and <i>Salmonella</i> Paratyphi Amebic liver abscess

- 1 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).
- 2 Inflammatory diarrhea is characterized by mucosal invasion with resulting inflammation and is caused by invasive or cytotoxic 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.

## Clinical Microbiology Testing

When submitting specimens for microbiologic testing, it is important to realize that clinical microbiology laboratories differ in protocols used for the detection of pathogens. To optimize recovery of an etiologic agent, physicians and other health care professionals should understand routine specimen-collection and testing procedures as well as circumstances and procedures for making special test requests. Some complex tests (eg, toxin testing, serotyping, molecular techniques) may only be available from large commercial or public health laboratories. Contact your microbiology laboratory for more information.

Stool cultures are indicated if the patient is immunocompromised, febrile, has bloody diarrhea, has severe abdominal pain, or if the illness is clinically severe or persistent. Stool cultures are also recommended if many fecal leukocytes are present. This indicates diffuse colonic inflammation and is suggestive of invasive bacterial pathogens such as *Shigella*, *Salmonella*, and *Campylobacter* and certain *E. coli* species. In most laboratories, routine stool cultures are limited to screening for *Salmonella* and *Shigella* species and *Campylobacter jejuni/coli*. Cultures for *Vibrio* and *Yersinia* species, *E. coli* O157:H7, and *Campylobacter species* other than *jejuni/coli* require additional media or incubation conditions and therefore require advance notification or communication with laboratory and infectious disease personnel.

Stool examination for parasites generally is indicated for patients with suggestive travel histories, who are immunocompromised, who suffer chronic or persistent diarrhea, or when the diarrheal illness is unresponsive to appropriate antimicrobial therapy. Stool examination for parasites is also indicated for gastrointestinal tract illnesses that appear to have a long incubation period. Requests for ova and parasite examination of a stool specimen will often enable identification of *Giardia lamblia* and *Entamoeba histolytica*, but a special request may be needed for detection of *Cryptosporidium* and *Cyclospora cayetanensis*. Each laboratory may vary in its routine procedures for detecting parasites, so it is important to contact your laboratory.

Blood cultures should be obtained when bacteremia or systemic infection is suspected.

Direct antigen detection tests and molecular biology techniques are available for rapid identification of certain bacterial, viral, and parasitic agents in clinical specimens. In some circumstances, microbiologic and chemical laboratory testing of vomitus or implicated food items also is warranted. For more information on laboratory procedures for the detection of foodborne pathogens, consult an appropriate medical specialist, clinical microbiologist, or state public health laboratory.

## Treating Foodborne Illness

Selection of appropriate treatment depends on identification of the responsible pathogen (if possible) and determining if specific therapy is available. Many episodes of acute gastroenteritis are self-limiting and require fluid replacement and supportive care. Oral rehydration is indicated for patients who are mildly to moderately dehydrated; intravenous therapy may be required for more severe dehydration. Routine use of anti-diarrheal agents is not recommended because many of these agents have potentially serious adverse effects in infants and young children.

Choice of antimicrobial therapy should be based on:

- Clinical signs and symptoms;
- Organism detected in clinical specimens;
- Antimicrobial susceptibility tests; and
- Appropriateness of treating with an antibiotic (some enteric bacterial infections are best not treated).

Knowledge of the infectious agent and its antimicrobial susceptibility pattern allows the physician to initiate, change, or discontinue antimicrobial therapy. Such information also can support public health surveillance of infectious disease and antimicrobial resistance trends in the community. Antimicrobial resistance has increased for some enteric pathogens, which dictates judicious use of this therapy.

Suspected cases of botulism are treated with botulinum antitoxin. Equine botulinum antitoxin for types A, B, and E can prevent the progression of neurologic dysfunction if administered early in the course of illness. Physicians and other health care professionals should notify their local and state health departments regarding suspected cases of botulism. CDC maintains a 24-hour consultation service to assist health care professionals with the diagnosis and management of this rare disease.

## Surveillance and Reporting of Foodborne Illness

Reporting of foodborne illnesses in the United States began more than 50 years ago when state health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of “enteric fever” be investigated and reported. The intent of investigating and reporting these cases was to obtain information about the role of food, milk, and water in outbreaks of gastrointestinal tract illness as the basis for public health actions. These early reporting efforts led to the enactment of important public health measures (eg, the Pasteurized Milk Ordinance) that profoundly decreased the incidence of foodborne illnesses.

Often health care professionals may suspect foodborne illness either because of the organism involved or because of other available information, such as several ill patients who have eaten the same food. Health care professionals can serve as the eyes and ears for the health department by providing such information to local or state public health authorities. Foodborne disease reporting is not only important for disease prevention and control, but more accurate assessments of the burden of foodborne illness in the community occur when physicians and other health care professionals report foodborne illnesses to the local and state health department. In addition, reporting of cases of foodborne illness by practicing physicians to the local health department may help the health officer identify a foodborne disease outbreak in the community. This may lead to early identification and removal of contaminated products from the commercial market. If a restaurant or other food service establishment is identified as the source of the outbreak, health officers will work to correct inadequate food preparation practices, if necessary. If the home is the likely source of the contamination, health officers can institute public education about proper food handling practices. Occasionally, reporting may lead to the identification of a previously unrecognized agent of foodborne illness. Reporting also may lead to identification and appropriate management of human carriers of known foodborne pathogens, especially those with high-risk occupations for disease transmission such as foodworkers.

Table 2 lists current reporting requirements for foodborne diseases and conditions in the United States. National reporting requirements are



determined collaboratively by the Council of State and Territorial Epidemiologists and the Centers for Disease Control and Prevention (CDC). Additional reporting requirements may also be mandated by state and territorial laws and regulations. Details on specific state reporting requirements are available from state health departments and from the Council of State and Territorial Epidemiologists and CDC.

Typically, the appropriate procedure for health care professionals to follow in reporting foodborne illnesses is to contact the local or state health department whenever they identify a specific notifiable foodborne disease. However, it is often unclear if a patient has a foodborne illness prior to diagnostic tests, so health care professionals should also report potential foodborne illnesses, such as when 2 or more patients present with a similar illness that may have resulted from the ingestion of a common food. Local health departments then report the illnesses to the state health departments and determine if further investigation is warranted.

Each state health department reports foodborne illnesses to CDC. CDC compiles these data nationally and disseminates information weekly to health officials via the Morbidity and Mortality Weekly Report and to the public through annual summary reports. CDC assists state and local public health authorities with epidemiologic investigations and the design of interventions to prevent and control food-related outbreaks. CDC also coordinates a national network of public health laboratories, called PulseNet, which performs “molecular fingerprinting” of bacteria (by pulsed-field gel electrophoresis) to support epidemiologic investigations.

Thus, in addition to reporting cases of potential foodborne illnesses, it is important for physicians to report noticeable increases in unusual illnesses, symptom complexes, or disease patterns (even without definitive diagnosis) to public health authorities. Prompt reporting of unusual patterns of diarrheal/gastrointestinal tract illness, for example, can allow public health officials to initiate an epidemiologic investigation earlier than would be possible if the report awaited definitive etiologic diagnosis.

Finally, new information on food safety is constantly emerging. Recommendations and precautions for people at high risk are updated whenever new data about preventing foodborne illness become available. Physicians and other health care professionals need to be aware of and follow the most current information on food safety.

**Table 2. Foodborne Diseases and Conditions Designated as Notifiable at the National Level, United States 2003**

Notifiable Bacterial Foodborne Diseases and Conditions	Notifiable Viral Foodborne Diseases and Conditions	Notifiable Parasitic Foodborne Diseases and Conditions
Anthrax Botulism Brucellosis Cholera Enterohemorrhagic <i>Escherichia coli</i> Hemolytic uremic syndrome, post-diarrheal Listeriosis Salmonellosis (other than <i>S. Typhi</i> ) Shigellosis Typhoid fever ( <i>S. Typhi</i> and <i>S. Paratyphi</i> infections)	Hepatitis A	Cryptosporidiosis Cyclosporiasis Giardiasis Trichinellosis
<p>In the United States, additional reporting requirements may be mandated by state and territorial laws and regulations. Details on specific state reporting requirements are available from state health departments and from the:</p> <p>Council of State and Territorial Epidemiologists                      (phone number: 770-458-3811). Information available electronically at:  <a href="http://www.cste.org/nndss/reportingrequirements.htm">www.cste.org/nndss/reportingrequirements.htm</a></p> <p>Centers for Disease Control and Prevention.                      Information available electronically at:  <a href="http://www.cdc.gov/epo/dphsi/phs/infdis2003.htm">www.cdc.gov/epo/dphsi/phs/infdis2003.htm</a></p>		

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**Or visit the following websites:**

The American Medical Association  
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The Centers for Disease Control and Prevention  
[www.cdc.gov/foodsafety/cme.htm](http://www.cdc.gov/foodsafety/cme.htm)

Center for Food Safety and Applied Nutrition,  
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