Shiga toxin-producing E. Coli (STEC)

A. Agent:
Escherichia coli (*E. coli)* are gram negative bacteria[1]. There are hundreds of serotypes, majority of which are normal inhabitants of the bowel and are benign to humans[2]. Serotyping identifies the antigens on the cell wall (O) and their flagella (H)[1]. Some *E. coli* produce *Shiga toxin*, which can cause serious illness, and are referred to as *Shiga toxin-producing E. coli,* or STEC[1-3]. STEC may also be referred to as enterohemorrhagic *E. coli* (EHEC) or Verocytotoxin-producing *E. coli* (VTEC)[3]. *E. coli* O157:H7 is the most commonly identified in news reports on outbreaks, though other "non-O157:H7" *E. coli* serotypes including O26, O45, O103, O111, O121 and O145 can cause illness and outbreaks as well[1,3].

B. Clinical Description:
STEC is associated with stomach cramps, diarrhea (often bloody), and vomiting. Some people may have a fever, which usually is not very high (less than 101˚F/38.5˚C). Most people get better within 5 to 7 days. Some infections are very mild, but others are severe or even life-threatening. About 5 to 10% of people who are diagnosed with STEC infection develop a potentially life-threatening complication known as hemolytic uremic syndrome (HUS)[3] HUS is more common in children, whereas, thrombotic thrombocytopenic purpura TTP is more common in adults. TTP and HUS are underlying pathological processes termed thrombotic microangiopathy TMA that cause endothelial injury, intravascular platelet-fibrin thrombi, and vascular damage.

About 15% of children with *E. coli* O157:H7 will develop HUS, a disease characterized by hemolytic anemia, thrombocytopenia and acute renal dysfunction[1,4]. HUS typically develops within 7 days after onset of diarrhea, but can take as long as 3 weeks[1]. However, if patients have no laboratory evidence of hemolysis, thrombocytopenia, or nephropathy 3 days after resolution of diarrhea, their risk of developing HUS is low[1]. Half of HUS cases will require dialysis, and about 5% die[1,4].

- Differential Diagnosis: Gastrointestinal illnesses due to *Shigella*, *Salmonella*, *Campylobacter*, and *Yersinia enterocolitica* may show similar signs and symptoms[5].

Patients with TTP have similar features seen in children with HUS causing hemolysis, thrombocytopenia, and nephropathy. Adult patients with TTP can also be febrile and develop neurological abnormalities.

C. Reservoirs:
STEC live in the guts of ruminant animals, including cattle, goats, sheep, deer, and elk. The major source for human illnesses is cattle. STEC that cause human illness generally do not make animals sick. Other kinds of animals, including pigs and birds, sometimes pick up STEC from the environment and may spread it[3].

D. Mode of Transmission:
Transmission of STEC occurs by fecal-oral route through food, drinking water, or recreational water contaminated with human or animal feces containing the bacteria[1-4]. Transmission may also occur directly from person to person, including by sexual contact (e.g., oral-anal contact)[1,4]. The infectious dose is very low[1,4]. STEC infection has been associated with the consumption of contaminated ground beef, unpasteurized apple juice and cider, unpasteurized milk, cheese and other dairy products, raw produce (notably, melons, lettuce, spinach, sprouts), and salami[1-4].

E. Incubation Period:
The incubation period for STEC infection is usually 3–4 days, but can range from 1–10 days[1,3].

F. Period of Communicability:
STEC is shed in stool during the initial period of diarrhea, then for a variable duration afterward. It is typically shed for 1 week or less in adults, but for up to 3 weeks in about one-third of infected children. Long term carriage is uncommon.

G. Susceptibility and Resistance: N/A

H. Treatment:
Supportive. Antibiotic therapy for STEC is not recommended[1-4]. STEC may enhance production and release of *Shiga toxins (STX)* in response to antibiotics which enhances the severity of clinical symptoms making HUS more likely to develop in cases treated with antibiotics.

Disease Management

I. Clinical Case Definition[6]:
An infection of variable severity characterized by diarrhea (often bloody) and abdominal cramps. Illness may be complicated by hemolytic uremic syndrome (HUS). (Note that some clinicians still use the term thrombotic thrombocytopenic purpura [TTP] for adults with post-diarrheal HUS.)

J. Laboratory Criteria for Diagnosis[6]:

Confirmatory results

- Isolation of *E. coli* O157:H7 from a specimen*, OR
- For all other *E. coli* isolates, identification of *Shiga toxin* or *Shiga toxin* genes

Supportive results

- Isolation of *E. coli* O157 from a clinical specimen, without confirmation of H antigen, detection of *Shiga toxin*, or detection of *Shiga toxin* genes, OR
- Identification of an elevated antibody titer against a known *Shiga toxin*-producing serogroup of E. coli, OR
- Detection of *Shiga toxin* or *Shiga toxin* genes in a clinical specimen using a culture-independent diagnostic test (CIDT) and no known isolation of Shigella from a clinical specimen, OR
- Detection of E. coli O157 or STEC/EHEC in a clinical specimen using a CIDT.

Criteria for Epidemiologic Linkage

- A clinically compatible illness in a person that is epidemiologically linked to a confirmed or probable case with laboratory evidence, OR
- A clinically compatible illness in a person that is a member of a risk group as defined by public health authorities during an outbreak.

Case Classification[6]	
Confirmed	A case that meets the confirmatory laboratory criteria.
Probable	• A person with isolation of E. coli O157 from a clinical specimen, without confirmation of H antigen, detection of *Shiga toxin*, or detection of *Shiga toxin* genes, **OR** • A clinically compatible illness in a person with identification of an elevated antibody titer against a known *Shiga toxin*-producing serogroup of E. coli, **OR**

	● A clinically compatible illness in a person with detection of *Shiga toxin* or *Shiga toxin* genes in a clinical specimen using CIDT and no known isolation of Shigella from a clinical specimen, **OR** ● A clinically compatible illness in a person with detection of E. coli O157 or STEC/EHEC from a clinical specimen using a CIDT, **OR** ● A clinically compatible illness in a person with an epidemiological linkage, as defined above.
Suspect	● A person with no known clinical compatibility that meets one of the last three supportive laboratory criteria for diagnosis: - Identification of an elevated antibody titer against a known *Shiga toxin*-producing serogroup of *E. coli*, **OR** - Detection of *Shiga toxin* or *Shiga toxin* genes in a clinical specimen using a CIDT and no known isolation of Shigella from a clinical specimen, **OR** - Detection of *E. coli* O157 or STEC/EHEC in a clinical specimen using a CIDT; **OR** ● A person with a diagnosis of case of post-diarrheal HUS (see HUS case definition)

*Note: *E. coli* isolated in urine, unless *Shiga toxin*-producing, is not reportable.

Criteria to Distinguish a New Case from an Existing Case

- A new case should be created when a positive laboratory result is received more than 180 days after the most recent positive laboratory result associated with a previously reported case in the same individual, OR
- When two or more different serogroups/serotypes are identified in one or more specimens from the same individual, each serogroup/serotype should be reported as a separate case.

K. Classification of Import Status:

Import status reflects where the *STEC* infection was acquired: in county, in state, international, out of county but in Arizona, out of state but in the U.S., or location of infection is unknown. Mark as *bi-national* if infection acquired in Canada or Mexico or food was consumed from Canada or Mexico and was not purchased in a U.S. store during the exposure period. For more information, please refer to the MEDSIS User Guide. You can find the guide in MEDSIS under: Resources → MEDSIS Documentation → User Guides.

L. Laboratory Testing:

The Gold Standard for diagnosing STEC is a stool culture[4]. Testing for STEC is typically included in clinical laboratories' routine stool culture, but some laboratories require a separate test be ordered[1]. Some laboratories culture for O157, but not for other strains of STEC that are also capable of severe disease and HUS. Many labs only screen for O157 and will not be able to identify O121 or other strains. Therefore, a negative test for O157 does not rule out the possibility of STEC infection. STEC O157 causes about 36% of STEC infections each year in the U.S., and non-O157 cause the rest[3].

Culture-Independent Diagnostic Tests (CIDTs) are non-culture tests that offer a more rapid turnaround time and the ability to test for multiple enteric pathogens simultaneously[7]. CIDTs appear to be a reliable indicator of STEC infection, as a 2012-2013 FoodNet surveillance study found that 2,205 of 2,409 (92%) of STEC positive CIDT specimens were also positive when cultured[7]. Lab results indicating CIDT may be recognized by the terms ELISA, PCR, EIA, GI panel, BioFire test, and/or NAAT (nucleic acid amplification test).

TEST[8]	SPECIMEN & TRANSPORT[8]	TESTING AVAILABILITY[8]
Culture	Feces (Cary-Blair transport medium or modified Cary-Blair transport medium). Must be kept cold (<10°C) during transport and should be received within 3 days of collection.	Available at ASPHL. Routine stool culture for enteric pathogens.
EIA/CIDT	Feces (Cary-Blair transport medium or modified Cary-Blair transport medium).	EIA and other culture-independent diagnostic testing (CIDT) specimens will be tested to confirm and isolate the results.
STEC Serotyping	Pure culture of isolate in a culture plate/slant (TSI or nutrient agar slant)	Available at ASPHL. Performed for epidemiological purposes using whole genome sequencing. Results typically available within 14 days.
STEC isolation (food)	Food product (200 grams of a solid product or about 100 ml of a liquid) collected in a sterile container and packed in a leak-proof shipping container with sealed ice packs (must be kept cold <10°C during transport)	Available at ASPHL for outbreak investigations. Results typically available within 10 days.
Whole Genome Sequencing (WGS)	Pure culture of isolate in a culture plate/slant (TSI or nutrient agar slant)	Available at ASPHL.

M. Assessing Laboratory Results:

See "STEC Case Classification flow chart" at the end of this guide. Note: Pathotypes of *E. coli* such as enteroaggregative *E. coli* (EAEC), enteroinvasive *E. coli* (EIEC), Enterotoxigenic *E. coli* (ETEC) and enteropathogenic *E. coli* (EPEC), which cause disease but do not produce *Shiga toxins*, are not reportable[9]. Please also refer to page 22 in the ADHS State Lab Guide

Individuals who are diagnosed with HUS but have no stool testing or negative stool test results meet the criteria for a suspect STEC case, and should be reported as both HUS and STEC[6].

Asymptomatic infections and infections at sites other than the gastrointestinal tract in people (1) meeting the confirmatory laboratory criteria for diagnosis or (2) with isolation of *E. coli* O157 from a clinical specimen without confirmation of H antigen, detection of *Shiga toxin*, or detection of *Shiga toxin* genes, are considered STEC cases and should be reported.

Although infections with *Shiga toxin*-producing organisms in the United States are primarily caused by STEC, in recent years an increasing number are due to infections by *Shiga toxin-producing Shigella*. Persons with (1) detection of *Shiga toxin* or *Shiga toxin* genes using a CIDT and (2) isolation of *Shigella* spp. from a clinical specimen should not be reported as an STEC case.

Due to the variable sensitivities and specificities of CIDT methods and the potential for degradation of *Shiga toxin* in a specimen during transit, discordant results may occur between clinical and public health laboratories. Persons with (1) detection of *Shiga toxin* or *Shiga toxin* genes using a CIDT and (2) the absence of isolation of *Shigella* from a clinical specimen, should be reported as a probable case, regardless of whether detection of *Shiga toxin* or *Shiga toxin* genes is confirmed by a public health laboratory.

N. Outbreak Definition[9,10]:

- Diagnosis or detection of two or more individuals from different households and families who experience an illness clinically compatible with *Shiga toxin-producing E. coli* infection, at least one with laboratory-confirmed *Shiga toxin-producing E. coli* infection, after exposure to a common food or a shared experience.
- An unexplained, unexpected increase in cases of *Shiga toxin-producing E. coli* infection that is clustered by time, place, or person.
    - An outbreak investigation is triggered when *Shiga toxin-producing E. coli* isolates from two or more individuals collected within 60 days of each other are determined to be highly related by WGS.

O. Time Frame[9]:

Providers, laboratories and schools must submit a report to the Local Health Department by telephone or through an electronic reporting system authorized by ADHS within 1 working day after a case or suspect case is diagnosed, treated, or detected or an occurrence is detected. Laboratories must submit a specimen, for each positive test result, to ASPHL within one working day after obtaining the positive test result.

Outbreaks should be entered into the MEDSIS Outbreak Module within 24 hours of receipt of report.

P. Forms:

- Please refer to the Department-provided formats for submitting Epidemiologic Investigation Reports for guidance on the required fields and forms for each morbidity.
- ADHS Reporting and Investigation Forms: https://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#investigations-forms

Q. Investigation Steps:

Confirm Diagnosis

- Obtain information on laboratory tests performed and results.
- If patient is hospitalized, obtain medical records, including admission notes, progress notes, lab report(s), and discharge summary. However, do not wait to receive these records to contact the case.
- If STEC or presumptive STEC (including *E. coli* O157) was isolated from clinical specimen or positive via a CIDT, ensure bacterial isolate or clinical material are forwarded to ASPHL[9].

Conduct Case Investigation

- Enter the case into MEDSIS as soon as possible.
- CDC Preparedness grant deliverables require an ***attempt*** **to interview an STEC case within 2 business days, and *complete* an interview and provide control measures within 3 business days.**
- Make at least 3 attempts to reach the case by phone at different times of the day before sending a letter to the case (depending upon local health department's protocols and capacity).

- Text messaging may also be used. An example text may read: “Hello, this is ____ from the Arizona Department of Health Services. Please contact me regarding important health information. My phone number is _____. Thank you.”
    - All interview attempts, even if unsuccessful (i.e., leaving a voicemail or text message), should be entered into the Case Contacted & Interviews table in MEDSIS as close to real time as possible.
    - If phone numbers appear invalid or non-functioning, contact food@azdhs.gov to request a LexisNexis search. This can be conducted for individuals 18 years and older. For those younger than 18, a parent/guardian name must be used to search LexisNexis; otherwise, the search can be conducted in ASIIS for the patient under 18 years old.

- It is best practice to obtain and review labs for possible cases of HUS/TTP even if the investigator is unable to get in contact with the patient. The investigator should complete the clinical data portion of the investigation from medical records and labs.
- Focus within the exposure period (7 days before onset) to identify potential sources of infection.
    - **Sick contacts**—both before and after onset. If there are secondary contacts, assess whether they are in a sensitive situation including daycare, school, healthcare or food handling. See “Conduct Contact Investigation” below. Clinically compatible contacts should be epi-linked according to the case definition, and a probable case should be created for them in MEDSIS.
    - **Travel history**—consider travel to other cities, states and/or countries. Obtain information about travel destination, dates of travel, living accommodations, and exposures which may have taken place during travel, including hotel and airport meals, daily activities, and animal, water or other environmental exposures. It may be helpful for the case to refer to a trip itinerary, if one is available.
    - **Food history**—obtain dates and locations of food purchase and/or food consumption. Consider the possibility of cross contamination.
        - Food purchased from grocery stores, including ready-to-eat meals. Obtain brand names or logo descriptions, if possible
        - Restaurants, fast food establishments, concession stands, convenience stores and cafeterias
        - Social gatherings, such as wedding, potlucks, banquets, picnics, barbecues
        - High risk foods, such as ground beef, poultry, game meat, melons, berries, sprouts, unpasteurized products, raw produce, dried or cured meat and fresh herbs

      NOTE: Identify whether the source of infection may be of major public health concern, such as a commercial raw milk dairy.

        - Water supply—well vs. municipal water source, exposure to untreated water
        - For infants, if a source is not identified, may need to obtain detailed epidemiologic data and cultures on caretaker(s), even if asymptomatic. Carefully review food-handling practices to determine whether cross-contamination of infant formula or food may be involved.
    - **Animal and environmental exposures**—including household pets, livestock, live poultry, reptiles and other exotic animals. Obtain information about pet foods and animal feed (brands or logo descriptions), as well as the age of the animals**.** Environmental: Assess whether the case has visited, worked or lived on/near a farm, ranch, or dairy, petting zoo, fair or pet shop**.**
    - **Assess for sensitive situations**—determine if the case is involved in a high-risk occupation or if another special situation is involved (e.g. food handler, daycare provider or attendee, direct patient care provider). Exclude the case as necessary. See “Special Considerations” section below.
    - **Educate the case on measures to avoid future illness and its transmission**.
        - See “Initiate Control and Prevention Measures” below.
        - Additional stool cultures are not routinely indicated.

Conduct Contact Investigation

- For STEC, contact investigation focuses on identifying individuals with symptoms consistent with STEC infection. These individuals would be considered probable cases Consider the following types of contacts during investigations:
  - General contacts: Household, close contacts and sexual partners of a case.
  - Daycare contacts: Staff involved with diapering and assisting with toileting of case(s), or contacts who share similar exposure activities with the case(s) (e.g. common food/drink, classroom materials, and animal or recreational water sources).
  - School Contacts: With epidemiologic evidence of transmission in a school setting, consider those who share similar exposure activities with the cases (e.g. common food/drink, animal or recreational water sources).
  - Food Service Contacts: Co-workers who work the same shift as the infected food handler, or patrons of the establishment of an infected food handler if (1) the food handler worked while infectious, (2) had poor personal hygiene, and (3) had the opportunity to have bare-hand contact with ready-to-eat food
- **Symptomatic contacts:** Obtain contact information for those who are symptomatic and complete an investigation. Symptomatic contacts should be considered probable cases and entered in MEDSIS. Initiate any work or daycare/school restrictions. Encourage them to seek medical evaluation. Follow-up with contacts may be needed to assure no further transmission of disease.
  - For epi-linked cases, please include the MEDSIS ID of the related case in the case notes section.
- **Asymptomatic contacts:** Provide education on avoiding further exposures. Encourage the contact to seek medical attention if symptoms develop.

Initiate Control and Prevention Measures

- Implement non-pharmaceutical interventions (NPIs) to prevent spread of disease. Inform the case and contacts of basic disease information, communicability, incubation period, symptoms, and ways to prevent transmission, using a fact sheet if desired.
- Hand hygiene considerations:
  - Emphasis on hand washing, cleaning fingernails and personal hygiene.
  - Washing hands thoroughly with soap and water for at least 20 seconds before eating, before and after handling or preparing food, after using the toilet, after changing diapers or handling feces, and after contact with animals.
  - When taking care of someone who has diarrhea, scrub hands with plenty of soap and water after cleaning the bathroom, helping the person use the toilet, or changing diapers, soiled clothes, or soiled sheets.
- Food and water considerations:
  - Symptomatic individuals should not prepare food or drinks for others.
  - Keep food that will be eaten raw, such as fresh produce, from becoming contaminated by animal-derived food products. (Wash fruits and vegetables thoroughly, especially those that will not be cooked.)
  - If served an undercooked hamburger or other undercooked ground beef product in a restaurant, send it back for further cooking. There should be no red or pink meat or juices. Ground beef should reach a temperature of 160°F (70°C).
  - Avoid drinking or swallowing untreated surface water. Surface water should be boiled or otherwise disinfected before consumption.
  - Cases of STEC should not enter a shared body of water (i.e., bathing with others or recreational water such as pools, hot tubs or splash pads) until they have been diarrhea free for 2 weeks.
- Consume only pasteurized products (milk, juice, cider, and cheese)
- Sexual contact considerations:

- Discuss transmission risks that may result from oral-anal sexual contact. Latex barrier protection (e.g., dental dam) may prevent the spread of *E. coli* O157:H7 to a case's sexual partners and may prevent exposure to and transmission of other fecal-oral pathogens.

- Sick contact(s) considerations:
  - If needed, work with appropriate regulatory personnel to ensure that work restrictions or exclusions are initiated for high-risk cases and/or contacts (e.g. food handler, daycare, direct patient care provider).
  - In the event that food service, child care center, or public supply is implicated in transmission, coordinate through the proper regulatory agency:
    - Food service: Environmental Health, Food Safety Team
    - Child care center: ADHS Child Care Licensing and Child Care Nurse Consultants in Maricopa County, Child Care Health Consultants in Pima Count if applicable, check with local health departments for resources.
    - Public supply: ADHS Environmental Health Food Safety Manager; ADHS Infectious Disease Preparedness Program Manager; LHD public health and environmental health; ADHS foodborne epidemiology group
    - ADHS epidemiology/food safety will coordinate with Federal Regulatory partners (FDA, USDA, CDC).

Isolation, Work and Child Care Restrictions

To prevent possible spread in child care and health care settings, enforce strict hand washing.

Per **A.A.C. R9-6-335**[9], exclude a *Shiga Toxin-producing Escherichia coli* case or suspect case with diarrhea from:
working as a food handler, caring for patients or residents in a health care institution, or caring for children in or attending a child care establishment until:

a. Two successive stool specimens, collected from the *Shiga toxin-producing Escherichia coli* case or suspect case at least 24 hours apart, are negative for *Shiga toxin-producing Escherichia coli;*
b. Diarrhea has resolved; or
c. The local health agency has determined that the case or suspect case is unlikely to infect others.; and
d. Using an aquatic venue for two weeks after diarrhea has resolved;

Case Management

- Educate the case on measures to avoid future illness and its transmission.
- To assure compliance with work restrictions, follow-up is indicated if a case cares for young children, the elderly or patients or handles food to assure compliance with work restrictions.
- Additional stool cultures are not routinely indicated, unless in an outbreak setting.

Contact Management

- Provide education on avoiding further exposures and to ensure proper medical care is obtained and precautions taken if symptoms develop.
- Symptomatic contact: considered a probable case; initiate any work or daycare/school restrictions. Encourage to seek medical attention.
- Follow-up of contacts may be needed to assure no transmission of disease.

Notifications

- Generally, routine notification through MEDSIS is appropriate for sporadic cases.
- Report data electronically via MEDSIS or by fax if necessary, including:

- All essential data that were collected during the investigation, especially data that helps to confirm or classify a case. Remember to verify that all key Disease Specific Observation fields are filled out.
- For epi-linked cases, please include the MEDSIS ID of the related case in the case notes section.

- If appropriate, work with the Public Information Officer to ensure appropriate and timely dissemination of public information.
- ADHS will notify the CDC and federal regulatory agencies (FDA, USDA), if/when necessary.

R. Outbreak Guidelines[10]:

Refer to the Outbreak section of the Disease Investigation Manual. For complete guidelines to investigating foodborne outbreaks, consult the ADHS Foodborne and Waterborne Disease Outbreak Investigation Resource Manual.

NOTE: See Infectious Disease Outbreak Investigation and Management webpage and Outbreak Threshold Guidelines – healthcare providers/facilities and schools/child care establishments/shelters for additional information/guidance.

Child Care Considerations:

- Case or contact is a daycare or school attendee[9,10]
  - Children with STEC who have diarrhea should be excluded per A.A.C. R9-6-335.
  - Children with STEC who have no diarrhea and are otherwise not ill may be excluded or may remain in the program if special precautions are taken.
- Case or contact is a daycare or school staff member
  - Since most staff in childcare programs are considered food handlers, those with STEC in their stools (symptomatic or not) can remain on site, but they must not prepare food or feed children per A.A.C. R9-6-335.
- Identify and isolate additional symptomatic cases:
  - Interview the daycare/school operator and ask them to review attendance records to identify staff or attendees with a history of diarrheal illness within the past 2 weeks.
  - Exclude symptomatic children and adults until diarrheal symptoms have resolved for 24 hours[9,10]
  - Testing of all symptomatic individuals is not recommended, unless used to confirm an outbreak
  - Coordinate activities with Child Care Licensing (602-364-2539) or Environmental Health (602-364-3118), if the facility is under their jurisdiction, to thoroughly inspect the facility.
  - Review findings with the daycare operator and implement control measures.
  - Educate on how to prevent disease transmission at center and at home (i.e. hand washing and disinfection). Investigate hand washing, diapering and disinfection procedures.

Health Care Considerations:

- If a health care setting-associated case or contact is identified, coordinate investigation efforts with infection control personnel.
- In long-term care facilities, residents with STEC should be placed on standard and contact precautions until their symptoms subside and they have one negative stool test for STEC.
- Staff members who provide direct patient care (e.g., feed patients, give mouth or denture care, or give medications) are considered food handlers and are subject to food handler restrictions. Staff and clients with STEC infection must refrain from handling or preparing food for residents until their symptoms have subsided or they have 2 negative stool tests taken at least 24 hours apart and collected at least 48 hours after completion of antimicrobial therapy, if treatment is received[9,10].

- Staff members with STEC infection who are not food handlers should not work until their diarrhea is resolved.

Case Is a Food Handler or Restaurant Is Implicated:

- Cases and contacts shall be excluded from handling food until 2 negative stool cultures have been obtained from specimens collected at least 24 hours apart or until symptoms are absent.
- Contact employer with information on the case control measures to be used, and send follow-up letter[9,10].
- Notify the Food Safety and Environmental Health offices (602-634-3118).
- Interview the manager and identify other possible cases among staff or patrons within the past 2 weeks. Note: workers in schools, residential programs, daycare and health care facilities, who feed, give mouth care or dispense medications to clients are subject to the same restrictions as food handlers.
- If a confirmed, probable, or suspect case is identified among staff or if 2 or more confirmed, probable, or suspect cases are associated with the facility, a thorough inspection of the establishment is indicated. Coordinate activities with Environmental Health.
- Collect stool specimens for culture from any symptomatic food handler.
- Initiate a foodborne outbreak investigation to determine food or foods contaminated.

Public Gathering Implicated:

- Food sources may include undercooked meat, cross-contaminated food, or possibly food contaminated by food handlers.
- Conduct active case finding; ask about recent illness among food handlers.
- If a food distributor is implicated, contact Environmental Health to coordinate the investigation.
- If animal sources are implicated:
  - Hygienic and control measures may need to be initiated on farms, petting zoos or fairs.
  - Pets and other domestic animals may need to be treated to control spread.
  - Proper hand washing after handling animals should always be stressed.

Intentional Contamination:

- If suspected, notify the Infectious Disease Preparedness Program Manager and PHEP Manager.
- Follow steps outlined in the Criminal and Epidemiological Investigation Handbook on how to conduct a joint Epi and Law Enforcement Investigation.
- Implement chain-of-custody procedures for all samples collected, as they will be considered evidence in a criminal investigation.
- Refer to the ADHS Foodborne Illness and Outbreak Investigation Manual.

Additional Information & Resources

Laboratory Resources
"Bacterial Enteric Infections Detected by Culture-Independent Diagnostic Tests — FoodNet, United States, 2012–2014" (CDC)
http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6409a4.htm

ADHS Guide to Laboratory Services: Microbiology:
https://www.azdhs.gov/preparedness/state-laboratory/public-health-microbiology/index.php

Foodborne and Waterborne Disease Outbreak Investigation Resource Manual:
http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/foodborne-waterborne-disease-outbreak-manual.pdf

ADHS *E. coli* Fact Sheet: https://www.azdhs.gov/preparedness/epidemiology-disease-control/foodborne/index.php#stec

Additional Information (CDC): https://www.cdc.gov/ecoli/

STEC Case Classification Flow Chart


STEC Case Classification Flow Chart
Please use positive results from any laboratory to classify the case, even if further testing is negative at ASPHL or CDC.
PCR+
Any other tests?
Look for the word detection of:
EHEC
STEC
O157
Shiga toxin genes
Culture – and/or EIA – OR no other test
Clinically compatible
Probable*
Not clinically compatible or unknown
Suspect*
Culture +
Follow flow for culture
EIA +
Follow flow for EIA
EIA +
Any other tests?
Look for the word detection of:
Shiga toxin
Shiga-like toxin
No other test
Clinically compatible
Probable*
Not clinically compatible or unknown
Suspect*
Yes
PCR (+ or -) but no culture OR Culture -
Clinically compatible
Probable*
Not clinically compatible or unknown
Suspect*
Culture +
Follow flow for culture
Culture +
Look for the word isolation of:
E. coli O157:H7
Escherichia coli
O157:H7
Confirmed
Non-O157
EIA+ and/or PCR+
Confirmed
PCR- and EIA-
Not a case
Serotype pending at CDC
"Evidence of shiga toxin-producing E. coli; unable to determine O type" (=PCR + and EIA + at ASPHL)
Confirmed
"Evidence of a shiga toxin-producing organism detected. Unable to isolate" (=PCR – and EIA + at ASPHL)
Await CDC results
Cases that meet a case classification without lab testing:
Diagnosis of post-diarrheal HUS/TTP without STEC testing (see HUS case definition) = SUSPECT
Clinically compatible person who is epi-linked = PROBABLE
*case classification met only if case has no known isolation of Shigella from a clinical specimen.

References

1. American Academy of Pediatrics. 2021 Red Book: Report of the Committee on Infectious Disease, 32nd Edition. Illinois, Academy of Pediatrics, 2021.

2. Arizona Department of Health Services. Foodborne Diseases: E. coli Infection [Internet]. Arizona Department of Health Services. [cited 2022January19]. Available from: http://www.azdhs.gov/preparedness/epidemiology-disease-control/foodborne/index.php#e-coli

3. E. coli (Escherichia coli) [Internet]. Centers for Disease Control and Prevention; 2021 [cited 2022January19]. Available from: https://www.cdc.gov/ecoli/

4. Bridges CB, Mounts A, Besselaar T, Fitzner J, Vandemaele K, Shindo N, Tam JS. *E. coli* Diarrheal Diseases. In: Heymann DL, editor. Control of communicable diseases manual. 20th ed. Washington, DC: American Public Health Association; 2015. p. 158-172.

5. Food Safety [Internet]. Centers for Disease Control and Prevention; 2016 [cited 2022January19]. Available from: https://www.cdc.gov/foodsafety/

6. Arizona Department of Health Services. In: Case Definitions for Reportable Communicable Morbidities: 2022. 2022 [cited 2022Feb24]; Available from: https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/casedefinitions/case-definitions.pdf

7. Iwamoto M, Huang JY, Cronquist AB, Medus C, Hurd S, Zansky S, et al. Bacterial Enteric Infections Detected by Culture-Independent Diagnostic Tests — FoodNet, United States, 2012–2014 [Internet]. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention; 2015 [cited 2022January19]. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6409a4.htm

8. Waddell V, Lavine DM, Slanta WM. Guide to Laboratory Services: Microbiology [Internet]. Guide to Laboratory Services: Microbiology. Arizona Department of Health Services; 2019 [cited 2022January19]. Available from: https://www.azdhs.gov/preparedness/state-laboratory/public-health-microbiology/index.php

9. Arizona Administrative Code. 2013Sep30 [cited 2022January19]; Available from: http://apps.azsos.gov/public_services/Title_09/9-06.pdf

10. Arizona Department of Health Services . Foodborne and Waterborne Disease Outbreak Investigation Resource Manual [Internet]. Foodborne and Waterborne Disease Outbreak Investigation Resource Manual. Arizona Department of Health Services; 2010 [cited 2017Apr24]. Available from: http://azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/outbreak-investigation-resource-manual.pdf