

SHIGELLOSIS SURVEILLANCE PROTOCOL

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HEALTHCARE PROVIDER RESPONSIBILITIES

1. Report shigellosis to your local health department within 72 hours of diagnosis. These include laboratory-confirmed asymptomatic infections and infections at sites other than the gastrointestinal tract. Complete the provider (yellow) section of the WVEDSS form found at <http://www.wvdhhr.org/idep/pdfs/wvedss/foodborne.pdf>. Forward the completed form to your local health department, and attach the laboratory report including gram stain, culture, and antimicrobial susceptibility. During community outbreaks, report confirmed and suspect cases immediately.
2. Management
 - ◆ If suspect shigellosis, collect stool samples and send to the laboratory for bacterial testing. If possible, collect stool samples before initiating antibiotic treatment.
 - ◆ *For patients with mild disease:* Most infections are self-limited (48 to 72 hours) and do not require antibiotic treatment. The main indication for using antibiotics is to prevent spread of disease. Antibiotics are effective in decreasing the duration of diarrhea and eradicating the organism from feces.
 - ◆ *For patients with severe disease, dysentery, or who are immunocompromised:* Initiate empiric treatment while awaiting for results of stool culture and antimicrobial susceptibility test.
 - ◆ Administer antimicrobial therapy for 5 days.
 - a. *For susceptible strains:* Ampicillin and Trimethoprim-sulfamethoxazole (TMP-SMX) are the preferred agents.
 - b. *Antimicrobial susceptibility unknown or Ampicillin and TMP-SMX resistant strain:* Recommend Ceftriaxone given parenterally or Azithromycin
 - ◆ Correct fluid and electrolyte loss, as necessary.
 - ◆ Antidiarrheal compounds are contraindicated.
3. *For hospitalized patients:* Contact precautions for the duration of illness, in addition to standard precautions.
4. Educate patient/s about the disease, how it is transmitted, and what can be done to prevent and/or control it.
 - ◆ Wash hands frequently with soap and water, especially after going to the toilet, after changing diapers, and before preparing food or beverages.
 - ◆ Properly dispose of soiled diapers.
 - ◆ Properly disinfect diaper changing areas after every use.
 - ◆ Advise parents/guardians to keep children with diarrhea out of child care settings.
 - ◆ Parents/guardians need to supervise handwashing of toddlers and small children after they use the toilet.
 - ◆ Persons with diarrheal illness should not prepare or handle food for others.

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5. For more information, please see: <http://www.wvdhhr.org/idep/a-z/a-z.asp>

LABORATORY RESPONSIBILITIES

1. Report the results to the local health department of the patient's county of residence or West Virginia Infectious Disease Epidemiology Program (IDEP) within 72 hours of detecting *shigella*; include antimicrobial susceptibility results. Contact the health department via fax or by telephone. See <http://www.wvdhhr.org/idep/default.asp> for details. During outbreaks, report positive cultures immediately.
2. Submit an isolate to the Office of Laboratory Services (OLS) for further testing. OLS contact information:
 - a. Telephone number: (304) 558-3530
 - b. Web address: <http://www.wvdhhr.org/labservices/>
 - c. Mailing address: 167 Eleventh Avenue
South Charleston, WV 25303

PUBLIC HEALTH ACTION

1. Educate healthcare providers, managers of congregate settings (daycare, nursing home, etc.), and the public about the disease, mode of transmission, and prevention and control measures.
2. Educate laboratories to submit *shigella* isolates to OLS for further testing.
3. Educate healthcare providers and laboratories to submit positive culture results and to the health department the results of antimicrobial susceptibility testing to the local health department.
4. Identify *probable cases* (clinically compatible case that is epidemiologically-linked to a confirmed case) and *confirmed cases* (case that meets the laboratory criteria for diagnosis). Investigate using *WVEDSS Foodborne and Waterborne Disease Investigation Form*. For sporadic cases, a food history is usually not necessary. Include bacterial culture and antimicrobial susceptibility results. Consult IDEP as needed, at 800-423-1271 or 304-558-5358.
5. Identify close contacts and household contacts of a case. Use *WVEDSS Foodborne and Waterborne Disease Investigation Form* to document contact investigation.
6. When an outbreak is identified or reported:

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- a. Immediately notify IDEP of the outbreak. Call 1-800-423-1271 or 304-558-5358.
- b. Ascertain cases. For shigellosis case definition, see *CASE DEFINITION FOR SHIGELLOSIS* in this protocol, or visit http://www.cdc.gov/epo/dphsi/casedef/shigellosis_current.htm
- c. Initiate control and preventive measures. See below for details.
- d. Report cases using *WVEDSS Foodborne and Waterborne Disease Investigation Form* (see section g. below).
- e. When necessary, create a linelist of all cases (probable and confirmed) and close contacts.
- f. Create an *epi-curve* using the information from the linelist. Using the *epi-curve*, assess the pattern of disease transmission, i.e. person-to-person or point source (food or water).
- g. Based on the pattern of disease transmission depicted by the *epi-curve*, focus the interview questions on specific risk factors. For example, for possible person-to-person disease transmission ask about daycare, school and occupational exposure and activity history; for point source transmission ask about food history, restaurant exposure, swimming and visit to waterparks (for possible waterborne transmission), and other activity history.
- h. Forward paper copy of laboratory report to IDEP.

7. Initiate general control measures:

- ◆ Emphasize good hand hygiene.
- ◆ Assure safe water supply/source.
- ◆ Proper storage and cooking of food.
- ◆ Exclude infected or symptomatic individuals as food handlers and preparers.
- ◆ Establish measures to decrease contamination of food by houseflies. (Important preventive measures in locations with outdoor privies/outhouses.)
- ◆ Advise individuals with diarrhea not to use recreational water venues (e.g. swimming pool, lakes, rivers, etc.) for 2 weeks after symptoms have resolved.

8. Specific preventive and control measures:

I. Infected food (and drink) handlers and preparers:

These apply to anyone who prepares or handle food and/or drink, e.g. food establishment workers, child care center staffs who prepare milk and food for center attendees.

A. Preventive and Control Measures

- ◆ Exclude infected or symptomatic individuals as food handlers and preparers.
- ◆ Emphasize good hand hygiene.
 - i. After using the toilet
 - ii. Before eating
 - iii. Between working with raw food and ready-to-eat food
- ◆ Assure safe water supply/source.

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- ◆ Proper storage and cooking of food.
- ◆ Exclude individuals with questionable hygienic habits from handling or preparing food and drink.

B. Reinstatement of a previously ill or infected employee (2005 Food Code)

Exclusion or restriction from handling and/or preparing food may be removed if an individual previously diagnosed with shigellosis meets one of the following conditions:

1. Excluded or restricted employee provides written medical documentation from a health practitioner stating that he/she is free of *shigella* infection based on 2 consecutive negative stool cultures taken:
 - Not earlier than 48 hours after discontinuation of antibiotics, AND
 - At least 24 hours apart
2. Employee was excluded or restricted after symptoms of vomiting or diarrhea resolved, and more than 7 calendar days have passed since the employee became asymptomatic.
3. Employee was excluded or restricted and did not develop symptoms and more than 7 calendar days have passed since the employee was diagnosed.

II. Educate household contacts to:

- ◆ Report the diarrheal illness to the health department and child care (or school) staff to appropriately address the management of a sick child.
- ◆ Consult a medical provider to appropriately manage the disease.
- ◆ Inform caregiver and household members to watch for signs and symptoms.
- ◆ Submit a stool culture from individuals with diarrhea.
- ◆ Stop individuals with diarrhea from handling or preparing food.

III. Child Care Centers

For details, see Daycare Licensing Regulations at

http://www.wvdhhr.org/bcf/ece/earlycare/regs/Title_78_Series_1.pdf

A. Preventive and Control Measures

- ◆ Meticulous hand hygiene. Carefully wash hands with soap and water before preparing food and drink, and after using the toilet and changing diapers. When access to soap and clean water is limited, waterless hand sanitizers may be used if hands are not visibly soiled.
- ◆ Ensure adequate access to hand washing sinks for toddlers to use before eating and after going to the toilet. Supervise handwashing among young children.
- ◆ Eliminate access to shared water play areas.
- ◆ Adherence to sanitary diaper changing techniques, including cleaning of diaper changing areas with antimicrobial solutions.
- ◆ Sanitary handling of food. Establish measures to decrease contamination of food.

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- ◆ Food preparation (including mixing formula) and diaper-changing responsibilities should be performed by different people whenever possible.
- ◆ When shigellosis is reported in a day care attendee or day care staff, culture stool from other symptomatic attendees and staff.
- ◆ Assure that staff with diarrhea are not involved in food handling or feeding. For details on how to manage infected daycare staff who handle and/or prepare food and drink (such as milk), see above recommendations under *Infected food (and drink) handlers and preparers*.
- ◆ All symptomatic (non-food preparer/handler) individuals who were found to have *shigella* should receive appropriate treatment* and should be excluded until the diarrhea stops and a stool culture taken 24 hours after completion of antibiotic treatment is negative for *shigella*.
- ◆ Special consideration: When daycare center resources allow and daycare staff/s determine that they can care for the child without compromising their ability to care for the health and safety of other children, cohorting convalescing children and staffs may be another option. Convalescing (previously ill but currently asymptomatic and are completing treatment) staff and child may be re-admitted into daycare by providing them with separate play/classroom ("sick room"), toys, equipment, supplies, and restroom; and excluding them from interacting with 'well' children. The child may be allowed to return to the regular room following completion of treatment and documentation of a stool culture negative for *shigella* (as above).

(*Note: Although most infections are self-limited, antimicrobial therapy shortens the duration of diarrhea and eliminate the bacteria.)

B. Exclusion from group setting

- ◆ Diarrhea or dysentery.
- ◆ Exclude infected individuals until treatment is complete and stool cultures are negative.

C. When to re-admit a daycare attendee

- ◆ After completion of treatment of infected individual (if indicated).
- ◆ Diarrhea (or dysentery) is resolved.
- ◆ When the child is able to participate and staff determine that they can care for the child without compromising their ability to care for the health and safety of other children.
- ◆ (Unless cohorting, as above) a stool culture collected 24 hours after completion of antibiotics is negative for *shigella*.

IV. Outbreaks in Pre-school, Kindergarten and Grade Schools

A. Preventive and Control Measures

- ◆ Meticulous hand hygiene. Carefully wash hands with soap and water before preparing food and drink, and after using the toilet and changing diapers. When access to soap and

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clean water is limited, waterless hand sanitizers may be an option if hands are not visibly soiled.

- ◆ Ensure adequate access to hand washing sinks to use before eating and after going to the toilet.
- ◆ Eliminate access to shared water play areas.
- ◆ Ensure that the students' hands are washed several times per day. Handwashing by younger students need to be supervised by an adult.
- ◆ Sanitary handling of food and drink. Establish measures to decrease contamination of food.
- ◆ Assure that staff with diarrhea are not involved in food handling or feeding. For details on how to manage infected staff who handle and/or prepare food and drink, see above recommendations under *Infected food (and drink) handlers and preparers*.
- ◆ All symptomatic (non-food preparer/handler) individuals who were found to have *shigella* should receive appropriate treatment* and should be excluded until the diarrhea stops and a stool culture taken 24 hours after completion of antibiotic treatment is negative for *shigella*.

(*Note: Although most infections are self-limited, antimicrobial therapy shortens the duration of diarrhea and eliminate the bacteria.)

B. Exclusion from school

- ◆ Diarrhea or dysentery.
- ◆ Exclude infected individuals until treatment is complete and stool cultures are negative.

C. When to re-admit to school

- ◆ After completion of treatment of infected individual (if indicated).
- ◆ Diarrhea (or dysentery) is resolved.
- ◆ When the child is able to participate and school staff determine that they can care for the child without compromising their ability to care for the health and safety of other children.
- ◆ In outbreak situations, the local health department may require a negative stool culture for readmission or may institute cohorting (if appropriate).

IV. Institutional (healthcare, longterm care, and residential care facilities) Outbreaks

- ◆ Strict attention to hand hygiene. Carefully wash hands with soap and water before preparing food and drink, and after using the toilet and between patient care. When access to soap and clean water is limited, waterless hand sanitizers may be an option.
- ◆ Assure that staff with diarrhea are not involved in food preparation, handling or feeding. For details on how to manage infected staff who prepare or handle food or feed patients, see above recommendations under *Infected food (and drink) handlers and preparers*.
- ◆ All symptomatic (non-food preparer/handler) staff who were found to have *shigella* should receive appropriate treatment* and should be excluded from having contact with

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residents/patients until the diarrhea stops and a stool culture taken 24 hours after completion of antibiotic treatment is negative for *shigella*.

- ◆ Establish a cohort system; ill individuals and newly admitted patients should be housed in separate areas.
- ◆ All symptomatic individuals who were found to have *shigella* should receive appropriate treatment. (Although most infections are self-limited, antimicrobial therapy shortens the duration of diarrhea and eliminates the bacteria.)

V. Laboratory Testing during an Outbreak

Immediately inform IDEP of the outbreak. If sending outbreak isolates or specimens to OLS for testing, inform IDEP so it can coordinate with OLS.

Send *shigella* isolates to OLS for serotyping and pulse-field gel electrophoresis. Collect the specimen in a clean container as soon as possible (before the start of antibiotic treatment) and transport using Cary Blair vial. For details, see

<http://www.wvdhhr.org/labservices/labs/micro/collection.cfm>

Request the laboratory that isolated the *shigella sp.* to perform antimicrobial susceptibility testing. OLS does not perform susceptibility testing.

DISEASE PREVENTION OBJECTIVES

Reduce the risk of disease by:

- ◆ Practicing good hand washing to prevent the person- to-person spread of disease.
- ◆ Practicing proper food handling and food preparation.

DISEASE CONTROL OBJECTIVES

Reduce the risk of spreading the disease by:

- ◆ Promptly identifying the case-patients and initiating appropriate management/treatment to prevent the spread of disease.
- ◆ Appropriately excluding affected foodhandlers/preparers, healthcare workers, daycare workers, and household contacts from certain responsibilities to prevent spread of disease.
- ◆ Identifying the epidemiologically-linked symptomatic cases and investigate as a case.
- ◆ Identifying and investigating outbreaks promptly and instituting control measures rapidly.

SURVEILLANCE OBJECTIVES

- ◆ Define the incidence of shigellosis in West Virginia.
- ◆ Describe the demographic characteristics of individuals affected by shigella.
- ◆ Describe the characteristics of individuals affected by shigella.

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- ◆ Determine the antimicrobial susceptibility pattern/s of *Shigella* isolates.
- ◆ Facilitate outbreak identification and investigation by using bacterial serotyping and pulse-field gel electrophoresis (PFGE) as a means to study the isolates.

PUBLIC HEALTH SIGNIFICANCE

Shigellosis is an intestinal infection caused by a bacteria of the genus *Shigella*. The infection occurs worldwide; two-thirds of the cases occur among children under 10 years of age. In the United States, an estimated 450,000 cases of shigellosis are reported each year, mostly among children less than 5 years of age. According to CDC during the period from 1989 to 2002, the average total annual incidence was 5.6 cases per 100,000 persons. A majority of the infection were caused by *S. sonnei*, while a few were due to *S. flexneri* and *S. boydii*. *S. dysenteriae* is rare in the U.S. Approximately 95% of *shigella* infections may be asymptomatic. Thus, the incidence may be many times higher than reported.

Most cases of shigellosis occur during the summer months. Outbreaks of *shigellosis* may be difficult to control and may persist in communities for months. Some of the recognized obstacles to the control of disease include:

- ◆ Ease of spread from person-to-person. The primary mode of transmission is the fecal-oral route, although infection may be spread by physical contact or by directly contaminating food and/or water.
- ◆ Disease transmission can occur with the infective dose as low as 10 to 100 organism.
- ◆ Many persons with shigellosis present with mild illness, so they remain in contact with and can transmit the infection to others.
- ◆ Rapidity at which the organism develops antimicrobial resistance.
- ◆ There is no vaccine.

Conditions that increase the risk for outbreaks include crowded living conditions (where hygiene is poor), prisons, daycare centers, and refugee camps. Outbreaks of shigellosis have been reported among men who have sex with men (MSM). Cases reported oral-genital or oral-anal contact during the week before diagnosis with *shigellosis*.

Resistance to antimicrobials are common among *shigella* species. Plasmid-mediated resistance has been identified in all species. The U.S. data received by NARMS from 1999-2003 showed that close to 80% of *shigella* isolates tested were resistant to ampicillin, while 38% were resistant to trimethoprim-sulfamethoxazole (TMP-SMX).

CLINICAL DESCRIPTION

Disease clinical presentation, severity and case-fatality rate vary with the host and the bacterial serotype. The disease spectrum can range from asymptomatic infection to severe dysentery. Shigellosis usually presents acutely with loose stools accompanied by fever, nausea, vomiting, cramps and tenesmus. Convulsions can occur in young children. Stools may contain blood and

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mucus (dysentery); and these are due to microabscesses and intestinal mucosa ulcerations caused by the invasive organism. A specific virulence plasmid is necessary for the epithelial cell invasiveness manifested by *Shigellae*.

S. dysenteriae 1 (Shiga bacillus) occurs in epidemics and is often associated with serious disease and complications such as toxic megacolon, intestinal perforation, and hemolytic-uremic syndrome. Among hospitalized cases, case-fatality can be as high as 20%. *S. flexneri* and *S. boydii* also present with bloody diarrhea and severe systemic symptoms. *S. flexneri* has been known to cause reactive arthropathy (Reiter syndrome) especially among persons who have the HLA-B27 antigen. *S. sonnei* infections generally present with watery diarrhea and run a shorter clinical course.

Shigellosis in the first 6 months of life is rare probably due to the presence of antibodies in the breast milk. Shigellosis in the newborn period is often a result of mother-to-infant fecal-oral transmission during labor and delivery, usually from asymptomatic mothers.

ETIOLOGY

The genus *Shigella* is comprised of 4 species, namely: *S. dysenteriae* (serogroup A), *S. flexneri* (serogroup B), *S. boydii* (serogroup C), and *S. sonnei* (serogroup D).

There are 4 major subgroups of *shigella*, designated A, B, C and D, and more than 40 recognized serotypes (table). The subgroups and serotypes are differentiated from one another by their biochemical traits and antigenic properties (O antigen).

Classification of *Shigella* Subgroups

| Subgroup | Species | Number of serotypes | Fermentation of D-mannitol | Subgroup B group antigens |
|----------|-----------------------|---------------------|----------------------------|---------------------------|
| A | <i>S. dysenteriae</i> | 15 | - | - |
| B | <i>S. flexneri</i> | 8 ^a | + | + |
| C | <i>S. boydii</i> | 20 | + | - |
| D | <i>S. sonnei</i> | 1 | + | - |

a = Serotypes 1-5 are subdivided into 11 subserotypes.

Among the *shigella* isolates reported in the U.S. from 1989 to 2000, 78% were *S. sonnei*, 19% were *S. flexneri*, 2% were *S. boydii*, and 1% were *S. dysenteriae*.

RESERVOIR

Humans are the only significant reservoir. No natural food products harbor endogenous *shigella* species, but a wide variety of foods may be contaminated.

MODE OF TRANSMISSION

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- Direct or indirect fecal-oral transmission from a symptomatic case or an asymptomatic carrier.
- Person-to-person transmission
 - ❑ Individuals who fail to thoroughly clean their hands and under the fingernails after defecation can transmit the bacteria.
 - ❑ Sexual contact
- Following ingestion of contaminated food or water
- Contact with a contaminated inanimate object
 - ❑ Houseflies transfer the organism

INCUBATION PERIOD

Usually 1 to 3 (up to 4) days, but may range from 12 to 96 hours up to 1 week.

INFECTIOUS PERIOD

Low infectious dose for humans. As few as 10 *S. dysenteriae* bacilli can cause clinical disease, whereas 100-200 bacilli are needed for *S. sonnei* or *S. flexneri* infection.

Symptomatic cases are infectious during the acute phase and until the agent is no longer found in the feces, which is usually about 4 weeks after the illness.

Asymptomatic cases may continue to carry the organism for months and longer. Thus, may transmit infection. A chronic carrier state (>1 year) is rare. Antimicrobial treatment can reduce the duration of carriage to a few days.

CASE DEFINITION FOR SHIGELLOSIS (2005 Case Definition)

Clinical description:

- ◆ An illness of variable severity characterized by diarrhea, fever, nausea, abdominal pain, and tenesmus. Headache and convulsions have been reported in some cases. Asymptomatic infections may occur.

Laboratory criteria for diagnosis:

- ◆ Isolation of *shigella* sp. from a clinical specimen.

Case classification:

- ◆ **Probable:** a clinically compatible case that is epidemiologically linked to a confirmed case.
- ◆ **Confirmed:** a case that meets the laboratory criteria for diagnosis. When available, O antigen serotype characterization should be reported.

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- ◆ **Comment:** Both asymptomatic infections and infections at sites other than the gastrointestinal tract, if laboratory confirmed, are considered confirmed cases that should be reported.

PREVENTIVE AND CONTROL MEASURES

- Emphasize good hand hygiene.
- Assure safe water supply/source.
- Proper storage and cooking of food.
- Breastfeeding provides protection for infants.
- Exclude infected or symptomatic individuals as food handlers and preparers.
- Establish measures to decrease contamination of food by houseflies.
- Advise individuals with diarrhea not to use recreational water venues (e.g. swimming pool, lakes, rivers, etc.) for 2 weeks after symptoms have resolved.

TREATMENT

- Most infections with *S. sonnei* are self-limited (48 to 72 hours) and do not require antibiotic treatment. However, antimicrobial therapy is effective in shortening the duration of diarrhea and eradicating organisms from feces. Treatment is recommended for patients with severe disease, dysentery or have impaired immune system. In mild disease, the main indication for treatment is to prevent spread of the organism.
- For cases with **susceptible** strains: Ampicillin and trimethoprim-sulfamethoxazole
 - ◆ Amoxicillin is less effective
 - ◆ Oral route is recommended but not for seriously ill patients
- For cases with **unknown antibiotic susceptibility** or is **resistant** to ampicillin and trimethoprim-sulfamethoxazole, the treatment options* are:
 - ◆ Parenteral ceftriaxone
 - ◆ Fluoroquinolone (e.g. ciprofloxacin)
 - ◆ Azithromycin

*Oral cephalosporins are not recommended. Fluoroquinolones are not recommended among those younger than 18 years of age unless potential benefits outweigh potential risks.

- Administer antibiotic treatment for 5 days.
- Antidiarrheal compounds that inhibit intestinal peristalsis are contraindicated.
- Fluids and electrolytes—as needed.
- Nutritional supplements: For areas where there is a high risk of malnutrition among children.

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SURVEILLANCE INDICATORS

- Proportion of investigations with complete demographic information.
- Proportion of investigations with complete information on high-risk occupations.
- Proportion of cases that with laboratory confirmation and serotype results.
- Proportion of confirmed cases with antimicrobial susceptibility profile.
- Proportion of cases with complete risk factor investigation from one to seven days before the onset of symptoms.

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