

# Diphtheria

## Surveillance and Investigation Protocol

---

### Table of Contents

I.	ABOUT THE DISEASE	2
A.	Clinical Presentation	2
C.	Reservoir	2
D.	Incubation Period	2
E.	Mode of Transmission	2
F.	Period of Communicability	2
II.	DISEASE CONTROL AND PREVENTION	3
A.	Disease Control Objectives	3
B.	Disease Prevention Objectives	3
C.	Disease Prevention and Control Intervention	3
D.	Treatment	4
III.	DISEASE INVESTIGATION	5
A.	Criteria for Case Ascertainment	5
B.	Reporting Timeframe to Public Health	7
C.	Outbreak Recognition	7
D.	HCP Responsibilities	7
E.	Laboratory Responsibilities	10
F.	Local Health Responsibilities	10
G.	State Health Responsibilities	13
H.	Occupational Health	13
IV.	DISEASE SURVEILLANCE	13
A.	Public Health Significance	14
B.	Disease Surveillance Objectives	14
C.	Surveillance Indicators	14
V.	REFERENCES	14

# Diphtheria

## Surveillance and Investigation Protocol

---

### I. ABOUT THE DISEASE

#### A. Clinical Presentation

Diphtheria is a vaccine-preventable disease caused by gram-positive bacillus. Patients with respiratory tract diphtheria may present with mild fever, sore throat, difficulty swallowing, and malaise. Most commonly affected respiratory sites are the pharynx, tonsil, larynx, and nose. A pseudomembrane (grayish membrane lining the tonsils, pharynx, larynx, or nares) appears within 2-3 days of illness. A respiratory infection may result in death. The disease may also present as mild infections in non-respiratory sites, such as the skin, and may appear as a scaling rash or ulcer with clearly demarcated edges and membrane.

While respiratory diphtheria is rare in the United States, non-respiratory infections caused by toxin-producing *Corynebacterium* have recently been detected. Non-respiratory disease caused by toxin-producing *Corynebacterium diphtheriae* may act as a source of transmission and can lead to new respiratory and non-respiratory infections. Both respiratory and non-respiratory disease caused by toxin-producing bacteria require public health follow-up.

#### B. Etiologic Agent

Diphtheria is caused by infection with toxigenic *Corynebacterium diphtheriae*. Two other *Corynebacterium* species (*Corynebacterium ulcerans* and *Corynebacterium pseudotuberculosis*) may produce the toxin. Toxin-producing *C. ulcerans* can cause disease indistinguishable from *C. diphtheriae*. Toxin producing *C. pseudotuberculosis* can cause lymphadenitis.

#### C. Reservoir

Humans are the reservoir.

#### D. Incubation Period

2-5 days (range: 1-10 days)

#### E. Mode of Transmission

Transmission is primarily from person-to-person through respiratory droplets. It may also occur from exposure to infected skin lesions or items soiled with discharge from lesions.

#### F. Period of Communicability

Transmission may occur as long as the virulent bacilli are present in discharges and lesions. In untreated persons, the organisms can be present in discharges and lesions two to six

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

weeks after infection. Treated persons are no longer contagious 48 hours after antibiotics have been given.

### II. DISEASE CONTROL AND PREVENTION

#### A. Disease Control Objectives

Prevent additional cases by:

1. Placing the site of the infection on the appropriate transmission-based precautions until deemed non-infectious.
2. Prompt investigation and case management.
3. Early identification and vaccination of close contacts.

#### B. Disease Prevention Objectives

Prevent diphtheria by encouraging vaccination of all susceptible individuals by following the Centers for Disease Control and Prevention's (CDC) [Diphtheria, Tetanus, and Pertussis Vaccine Recommendations](#).

1. Age-appropriate vaccination with diphtheria toxoid containing vaccine.
2. Travelers to countries with endemic or epidemic diphtheria should have their vaccination status updated prior to travel.

#### C. Disease Prevention and Control Intervention

##### Prevention

1. Vaccination is highly effective in preventing symptomatic disease. However, it does not prevent colonization.
2. Vaccination is estimated to reduce transmission by 60% through reduced symptomatic shedding.
3. Vaccination with antibiotics accelerates the clearance of colonization and interrupts disease transmission. Rapid antibiotic treatment of symptomatic cases is essential.

##### Control Measures

1. Isolate the patient.
    - a. Respiratory diphtheria - Standard precautions and droplet precautions are recommended for patients and carriers until two negative cultures from the nose and throat collected 24 hours apart are negative following completion of antibiotics.
    - b. Cutaneous diphtheria – Contact precautions for patients until two negative cultures from skin lesions taken 24 hours apart and 24 hours after completion of antibiotics are negative.
- 

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

2. Conduct contact tracing and provide antibiotic prophylaxis to contacts. Close contacts are defined as all household members, persons caring for infected children, persons with history of frequent and close contact with the case, and persons directly exposed to respiratory secretions of a patient suspected with the infection such as healthcare workers.
3. Regardless of vaccination status of close contact:
  - Monitor for possible illness from 7 to 10 days from the time they were last exposed
  - Culture for *C. diphtheriae*
4. Erythromycin PO for 7-10 days or PCN G benzathine IM single dose. For contacts who are carriers: After completion of antibiotic treatment, follow-up culture of pharyngeal specimens. If cultures remain positive, administer another 10-day course of Erythromycin. Repeat cultures to document elimination of bacteria.
5. For asymptomatic and previously vaccinated close contacts: Age-appropriate booster of diphtheria toxoid containing vaccine if not received a booster within five years.
6. For asymptomatic close contacts with less than three doses of diphtheria toxoid containing vaccine or unknown vaccination status: Administer age-appropriate vaccine.
7. For contacts who cannot be monitored: Administer PCN G benzathine instead of Erythromycin. If not vaccinated or vaccination status is unknown, vaccinate with age-appropriate diphtheria toxoid containing vaccine. Diphtheria antitoxin is not recommended for unvaccinated close contacts.

If non-toxigenic strain, public health can discontinue investigation of contacts.

For healthcare worker prevention and control recommendations, see **III. D. HCP Responsibilities**.

### **D. Treatment**

1. Antitoxin: Diphtheria antitoxin (DAT) should be administered before culture results are available and should be based on clinical presentation, travel history, and vaccination status. DAT does not neutralize toxin that is already fixed to tissues but will neutralize circulating toxin and prevent disease progression. DAT is not commercially available. For indication, instructions for administration, and specific recommendations, contact the CDC Emergency Operations Center at 1-770-488-7100. To rapidly neutralize the toxin, IV administration is preferred. (Note: Before IV DAT, test the patient for sensitivity to horse serum. See product instructions for details.)
2. Antimicrobial therapy:
  - Erythromycin orally or parenterally for 14 days, or
  - Aqueous penicillin G IV for 14 days, or

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeeps.wv.gov](http://oeeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

- Penicillin (PCN) G procaine IM for 14 days

Document elimination of the organism by obtaining specimens 24 hours following completion of treatment. Elimination is defined as two consecutive negative cultures from specimens taken 24 hours apart.

3. For cutaneous diphtheria: Thoroughly clean the lesion with soap and water. Administer appropriate antibiotic for ten days.
4. Supportive treatment should be continued until symptoms are controlled.
5. Immunization: Actively immunize the patient during convalescence from diphtheria as the infection does not necessarily confer immunity.
6. For carriers (toxigenic strain or not) – Immunize promptly. If previously immunized but has not received a booster of diphtheria toxoid within five years, give age-appropriate booster containing diphtheria toxoid\* (DTaP, Tdap, or Td). Carriers should also receive Erythromycin PO for 10-14 days or Benzathine Penicillin G single IM dose. Document bacterial elimination by obtaining respiratory cultures 24 hours after antibiotic completion and showing two negative cultures taken 24 hours apart. If results are positive, an additional ten days of PO Erythromycin is recommended. Perform follow-up cultures again.

\*In 2023, Sanofi Pasteur, Inc. discontinued manufacturing diphtheria and tetanus toxoids absorbed vaccine (DT).

### III. DISEASE INVESTIGATION

#### A. Criteria for Case Ascertainment

Report any illness to public health authorities that meets any of the following criteria:

##### Clinical Criteria for Reporting

Acute upper respiratory illness in a person with an adherent membrane of the nose, pharynx, tonsils, or larynx, which is suspected by a HCP to be possible diphtheria, and for which there is not a more likely diagnosis.

##### Laboratory Criteria for Reporting

Isolation of toxin-producing *C. diphtheriae* from any anatomical site.

##### Vital Records for Reporting

Death certificate lists diphtheria as a cause of death or significant condition contributing to death.

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

### Other Criteria for Reporting

A person who is suspected by a HCP to have a diagnosis of diphtheria and who is a contact of a laboratory-confirmed case of diphtheria.

### **Case Definition and Case Classification**

#### Clinical Criteria

- Upper respiratory tract illness with an adherent membrane of the nose, pharynx, tonsils, or larynx, **OR**
- Infection of a non-respiratory anatomical site (e.g., skin, wound, conjunctiva, ear, genital mucosa)

#### Laboratory Criteria for Diagnosis

*Confirmatory laboratory evidence:*

- Isolation of *C. diphtheriae* from any site **AND**
- Confirmation of toxin-production by Elek test or by another validated test capable of confirming toxin-production

*Supportive laboratory evidence:*

- Histopathologic diagnosis

#### Epidemiologic Linkage

Epidemiologic linkage requires direct contact with a laboratory-confirmed case of diphtheria.

#### Criteria to Distinguish a New Case from an Existing Case

Individuals without evidence of clinical criteria as described by the diphtheria surveillance case definition but for whom toxin-producing *Corynebacterium diphtheriae* is confirmed via laboratory testing (isolation and toxigenicity testing by modified Elek test or other validated test capable of confirming toxin-production) should not be classified as cases. These individuals are considered carriers of the bacteria and are not reportable.

#### Case Classification

##### **Suspected**

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

- In the absence of a more likely diagnosis, an upper respiratory tract illness with each of the following:
  - an adherent membrane of the nose, pharynx, tonsils, or larynx **AND**
  - absence of laboratory confirmation **AND**
  - lack of epidemiologic linkage to a laboratory-confirmed case of diphtheria.

**OR**

- Histopathologic diagnosis

**Confirmed**

- An upper respiratory tract illness with an adherent membrane of the nose, pharynx, tonsils, or larynx and any of the following:
  - isolation of toxin-producing *Corynebacterium diphtheriae* from the nose or throat **OR**
  - epidemiologic linkage to a laboratory-confirmed case of diphtheria.

**OR**

- An infection at a non-respiratory anatomical site (e.g., skin, wound, conjunctiva, ear, genital mucosa) with isolation of toxin-producing *C. diphtheriae* from that site.

**Case Classification Comments**

- Cases of laboratory-confirmed, non-toxin-producing *C. diphtheriae* (respiratory or non-respiratory) should not be reported by state or local health departments to CDC as diphtheria cases.
- Negative laboratory results may be sufficient to rule-out a diagnosis of diphtheria; however, clinicians should carefully consider all lab results in the context of the patient's vaccination status, antimicrobial treatment, and other risk factors.
- PCR (polymerase chain reaction) and MALDI-TOF (matrix assisted laser desorption/ionization-time of flight mass spectrometry) diagnostics for *C. diphtheriae*, when used alone, do not confirm toxin production. These tests, when used, should always be combined with a test that confirms toxin production, such as the Elek test.

**B. Reporting Timeframe to Public Health**

Report to the local health department within 24 hours of notification.

**C. Outbreak Recognition**

Since the expected incidence of diphtheria is zero, one case of diphtheria in West Virginia is an outbreak.

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

### D. HCP Responsibilities

1. Consider diphtheria in a patient with clinically compatible symptoms who has recently traveled abroad or who has had contact with a case.
2. Immediately isolate the patient suspected with diphtheria and notify the facility infection preventionist.
  - a. Respiratory diphtheria – implement standard and droplet precautions.
  - b. Cutaneous diphtheria – implement standard and contact precautions.
3. Personnel caring for the patient should be up to date on diphtheria immunization including receipt of age-appropriate diphtheria vaccine or booster within five years.
4. Antitoxin must be administered as soon as possible according to CDC guidance. Notify the local health department or DIDE at 304-558-5358, ext. 2 to request the antitoxin from CDC.
5. If *C. diphtheriae* or *C. ulcerans* are isolated, they must be tested for toxin production.
6. Obtain specimens prior to starting antibiotics. For specific treatment recommendations, see II. D. Treatment.
7. Specimen collection and laboratory testing:
  - a. Specimens for culture should be obtained from any mucosal or cutaneous lesion. Preferably obtain the material from beneath the membrane or the membrane itself. Obtain the material before the patient receives antibiotic. However, do not delay initiation of antibiotics.
  - b. PCR and MALDI-TOF may identify *C. diphtheriae* but do not confirm toxin production.
  - c. Test for other pathogens that may have similar presentation, such as group A beta-hemolytic streptococci, *Staphylococcus aureus*, *Candida* sp., Epstein-Barr virus, cytomegalovirus, adenovirus, and herpes.
  - d. Isolation of *C. diphtheriae* and testing for toxin production by Elek test: Submit the specimen or isolate to the West Virginia Office of Laboratory Services (OLS) for CDC confirmatory testing. CDC is the only laboratory that performs Elek test. If sending specimens to OLS:
    - i. Notify OLS prior to shipment by calling 304-558-3530.
    - ii. Please make sure the package arrives between Monday and Friday. If sending during a holiday, make sure the package arrives on a business day.
    - iii. For throat, nasal, or wound, swab for culture and PCR: Ship refrigerated overnight with refrigerated or frozen cold packs within 24-72 hours of collection.
    - iv. For pseudomembrane or heart tissue for culture and PCR: Ship refrigerated overnight with refrigerated or frozen cold packs within 24-48 hours of collection.

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeeps.wv.gov](http://oeeps.wv.gov)



# Diphtheria

## Surveillance and Investigation Protocol

---

- v. For throat, nasal, or wound swab, for PCR only (no culture): Ship frozen overnight with dry ice within one week of collection. Once frozen, do not allow swab to thaw.
      - vi. For pure culture isolate for confirmation by culture and/or PCR: Ship refrigerated overnight with refrigerated or frozen cold packs OR ship ambient overnight with room temperature cold packs.  
Note: The original isolate should be retained by the submitter for the duration of testing at CDC.
      - vii. All samples must be shipped in accordance with applicable local, state, and federal regulations.
8. If antibiotic therapy was started prior to specimen collection from a suspected diphtheria case, and culture was negative for *C. diphtheriae*, two sources of evidence can help support presumptive diagnosis:
  - a. A positive polymerase chain reaction (PCR) test for diphtheria *tox* gene
  - b. Isolation of *C. diphtheriae* from cultures of specimens from close contacts
9. Administer age-appropriate vaccination for diphtheria during convalescence.
10. Obtain cultures after completion of antibiotic treatment. Patients are usually no longer contagious 48 hours after antibiotics have been given. Elimination of the organism should be documented by two consecutive negative cultures taken 24 hours apart, with the first specimen collected 24 hours after therapy is completed.
11. Assist public health in investigating the case and contact tracing. Provide clinical, laboratory, and vaccine information, and a list of close contacts (household, community, and health care setting).
12. If transferring a patient to another facility, notify the infection preventionist of the receiving health care facility **BEFORE** transferring the patient.
13. For **health care personnel** who have an **exposure to diphtheria**, regardless of vaccination status:
  - Administer postexposure prophylaxis in accordance with CDC recommendations.
  - Exclude from work and obtain nasal and pharyngeal swabs for diphtheria culture.
    - If nasal AND pharyngeal cultures are negative for toxin-producing *C. diphtheriae*, health care personnel may return to work while completing postexposure antibiotic therapy.
    - If nasal OR pharyngeal cultures are positive for toxin-producing *C. diphtheriae*:
      - Complete postexposure antibiotic therapy.
      - Healthcare personnel may return to work when:
        - Postexposure antibiotic therapy is completed AND

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeps.wv.gov](http://oeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

- At least 24 hours after completion of postexposure antibiotic therapy, two consecutive pairs of nasal AND pharyngeal cultures, obtained at least 24 hours apart, are negative for toxin-producing *C. diphtheriae*.
  - Implement daily monitoring for the development of signs and symptoms of diphtheria for seven days after the last exposure.
14. For **healthcare personnel with respiratory diphtheria infection**, exclude from work until:
- Antibiotic and antitoxin (if needed) therapy are completed AND
  - At least 24 hours after completion of antibiotic therapy, two consecutive pairs of nasal AND pharyngeal cultures, obtained at least 24 hours apart, are negative for toxin-producing *C. diphtheriae*.
15. For **healthcare personnel with cutaneous diphtheria infection** or other diphtheria infection manifestations, determine the duration of exclusion from work in consultation with public health authorities.

### E. Laboratory Responsibilities

1. Immediately notify the HCP and the infection preventionist of a positive laboratory result for diphtheria.
2. Immediately notify the local health department and DIDE at 304-558-5358, ext. 2 of a positive diphtheria test result.
3. In addition to a telephone call, send the positive laboratory report via electronic laboratory report (ELR) or fax a copy to the local health department.
4. Send the specimen or isolate to the OLS so it can be sent to CDC for further testing. Notify the DIDE at 304-558-5358, ext. 2 and OLS 304-558-3530 prior to shipment.
5. See CDC instructions for [Corynebacterium diphtheriae/ulcerans/pseudotuberculosis Detection, Identification, and Toxin Testing](#).

### F. Local Health Responsibilities

1. Educate HCPs and laboratories to report a suspected case of diphtheria to the health department. The health department should be notified by telephone to ensure the report is received.
2. Educate HCPs about diphtheria infection, testing, and prevention, and control measures.
3. Ensure employees who will investigate a case of diphtheria via face-to-face are up to date on diphtheria immunization including receipt of age-appropriate diphtheria vaccine or booster within five years. Employees should utilize contact and droplet precautions when interviewing a case face-to-face.
4. Investigate any suspected case of diphtheria using the [Diphtheria Case Report Form](#).

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeeps.wv.gov](http://oeeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

The collected information should be transferred to the West Virginia Electronic Disease Surveillance System (WVEDSS) investigation.

5. Identify and investigate all close contacts of the patient. Close contacts are defined as all household members, persons caring for infected children, and persons directly exposed to respiratory secretions of the patient such as health care workers.
  - Ensure that close contacts receive recommended antibiotic prophylaxis.
  - Monitor close contacts for possible illness from 7 to 10 days from the time they were last exposed.
  - Culture for *C. diphtheriae*. After completion of antibiotic treatment, follow-up culture of pharyngeal specimens. If cultures remain positive, administer another 10-day course of Erythromycin. Repeat cultures to document elimination of bacteria.

### Case Management

1. Immediately notify DIDE at 304-558-5358, ext. 2, so antitoxin can be obtained.
2. Ascertain the case and immediately initiate control measures. Provide guidance to facility where case was present while contagious. Determine where a case may have been exposed. Obtain accurate and complete immunization history and document any doses of diphtheria-containing vaccine. Vaccination histories may be obtained from West Virginia Statewide Immunization Information System (WVSIS), schools, medical providers, or on immunization records provided by the patient.
3. Make sure the case is isolated using contact and droplet precautions.
  - a. Respiratory diphtheria - Standard precautions and droplet precautions are recommended for patients and carriers until two negative cultures from the nose and throat collected 24 hours apart are negative following completion of antibiotics.
  - b. Cutaneous diphtheria – Standard and contact precautions for patients until two negative cultures from skin lesions taken 24 hours apart and 24 hours after completion of antibiotics are negative.
  - c. Advise HCP to collect appropriate specimens from the throat, nose, pharynx, or cutaneous lesion. Remind the HCP to collect specimens prior to starting antibiotics. If sending specimens to OLS, facilitate transport of specimens to OLS. For case management, recommend the following to the HCP:
    - Diphtheria antitoxin (DAT) should be administered before culture results are available and should be based on clinical presentation, travel history, and vaccination status. DAT does not neutralize toxin that is already fixed to tissues but will neutralize circulating toxin and prevent disease progression. DAT is not commercially available. For indication, instructions for administration, and specific recommendations, contact the CDC Emergency Operations Center at 1-

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oepe.wv.gov](http://oepe.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

770-488-7100. To rapidly neutralize the toxin, IV administration is preferred. (Note: Before IV DAT, test the patient for sensitivity to horse serum. See product instructions for details.)

4. For specific treatment recommendations, **see II. D. Treatment.**
5. For carriers (toxigenic strain or not) – Immunize promptly. If previously immunized but has not received a booster of diphtheria toxoid within five years, give age-appropriate booster containing diphtheria toxoid (DTaP, Tdap, or Td). Carriers should also receive Erythromycin PO for 10-14 days or Benzathine Penicillin G single IM dose. Document bacterial elimination by obtaining respiratory cultures 24 hours after antibiotic completion and showing two negative cultures taken 24 hours apart. If results are positive, an additional 10 days of PO Erythromycin is recommended. Perform follow-up cultures again.
6. Identify the source of infection for every case of diphtheria. Case-patients should be asked about contact with other known cases. When no history of contact with a known case can be elicited, opportunities for exposure to unknown cases should be sought through a thorough interview covering travel history, activities, and events to include dates attended. For cases involving multi-state or international travel, consult with the Regional Epidemiologist and the DIDE. After determining when and where transmission likely occurred, investigative efforts should be directed to locations visited.
7. Consider notifying local providers through a health alert or other activities to enhance reporting of other cases of diphtheria.
8. For the purpose of case investigation, lost to follow-up (LTF) is defined as a disease investigation outcome reported by a local health department staff in WVEDSS after:
  - all avenues (e.g. phone call, text messaging, visit, mailed letter, email, etc.) of obtaining patient information, on at least three separate occasions (different days and times) have been exhausted, AND
  - attempts to collect patient medical information from the HCP on at least three separate occasions have been exhausted, AND
  - attempts to contact patient or obtain information has been clearly documented in WVEDSS, AND
  - documentation has been completed within 30 days of the patient’s investigation start date.

### **Managements of Contacts**

Close contacts are defined as all household members, persons caring for infected children, persons with history of frequent and close contact with the case, and persons directly exposed to respiratory secretions of a patient suspected with the infection such as health

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeeps.wv.gov](http://oeeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

care workers.

1. Assess potential for transmission and identify contacts of the case during the infectious period.
2. Conduct contact tracing of close contacts.
3. For management of health care workers exposed to diphtheria, see **III. D. HCP Responsibilities**.
4. Regardless of vaccination status of close contact:
  - conduct disease surveillance for 7 to 10 days from last exposure to untreated patient
  - culture for *C. diphtheriae*
5. Treat contacts with Erythromycin PO for 7-10 days or PCN G benzathine IM single dose.
6. For contacts who are carriers: after completion of antibiotic treatment, follow-up culture of pharyngeal specimens. If cultures remain positive, administer another 10-day course of Erythromycin. Repeat cultures to document elimination of bacteria.
7. For asymptomatic and previously vaccinated close contacts: age-appropriate booster of diphtheria toxoid containing vaccine if not received a booster within five years.
8. For asymptomatic close contacts with less than three doses of diphtheria toxoid containing vaccine or unknown vaccination status: administer age-appropriate vaccine.
9. For contacts who cannot be kept under surveillance: administer PCN G benzathine instead of Erythromycin. If not vaccinated or vaccination status is unknown, vaccinate with age-appropriate diphtheria toxoid containing vaccine. Diphtheria antitoxin is not recommended for unvaccinated close contacts.
10. If non-toxigenic strain is identified, public health can discontinue investigation of contacts.

### **G. State Health Responsibilities**

1. Promptly report case(s) of diphtheria to the CDC within 24 hours of notification.
2. Assist local health jurisdictions in the investigation.
3. Provide technical support on surveillance, investigation, case ascertainment, laboratory testing, and control and prevention of diphtheria.
4. Maintain diphtheria awareness among public health partners and the public.
5. Develop guidance documents, protocols, alerts, and information sheets for public health and HCPs.
6. Review diphtheria reports in WVEDSS for completeness prior to submission to CDC. *No Local Health Action* is defined as no activity occurring at the local level for at least 30 days since the date the investigation started. The state health department staff shall document the public health action in WVEDSS before administratively closing the investigation.

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeps.wv.gov](http://oeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

### H. Occupational Health

Healthcare workers investigating a case of diphtheria in-person should:

- Make sure the interviewer is up-to-date on diphtheria immunization, and must be a recipient of an age-appropriate diphtheria vaccine or booster within five years.
- Utilize the appropriate transmission-based precautions based on the site of infection.

## IV. DISEASE SURVEILLANCE

### A. Public Health Significance

There are two forms of diphtheria: respiratory and cutaneous. Respiratory infections progress from prodromal symptoms to membranous inflammation of the pharynx, tonsils, and larynx. This disease has a high risk of mortality.

Approximately 80% of untreated symptomatic patients progress to membranous diphtheria within 2-3 days following symptom onset. Within 1-2 weeks, death from asphyxia follows as a result of airway obstruction. Toxic cardiomyopathy occurs 7-14 days after respiratory symptoms and is responsible for 20%-25% of deaths. Neurological disorders (hypoesthesia, polyneuropathy, cranial neuropathy) can develop weeks to months after the infection and occur in 20%-25% of untreated cases. Fatality for untreated and unvaccinated is estimated at 29%.

Many colonized persons never develop symptoms. In a study by “ Truelove et al, (2020)” – year of publication, 31% of infections in unvaccinated persons have no symptoms. Untreated persons remain colonized for 18 days with some remaining colonized more than 48 days.

### B. Disease Surveillance Objectives

1. To rapidly detect and investigate a case of diphtheria in West Virginia.
2. Characterize the case by:
  - a. detecting bacterial toxin production
  - b. reporting on the anatomic site of toxigenic diphtheria infection
  - c. identifying sources and sites of transmission including risk factors for infection
3. Monitor the effectiveness of outbreak control strategies.

### C. Surveillance Indicators

---

**Bureau for Public Health - Office of Epidemiology and Prevention Services**  
**Division of Infectious Disease Epidemiology (DIDE)**

350 Capitol Street Room 125, Charleston, WV 25301-3715  
Phone: 304-558-5358, ext. 2 • Fax: 304-558-6335 [oeeps.wv.gov](http://oeeps.wv.gov)

# Diphtheria

## Surveillance and Investigation Protocol

---

1. The proportion of confirmed cases reported to CDC National Notifiable Disease Surveillance System with complete information (clinical information, hospitalization, laboratory testing, vaccination history, date reported to health department, transmission setting, epidemiologic information, date of birth, and onset date).
  2. The interval between the date of symptom onset and date of public health notification. \_\_\_\_\_
- 

### V. REFERENCES

1. Truelove SA, Keegan LT, Moss, WJ, Chaisson LH, Macher E, Azman AS, Lessler J. Clinical and Epidemiological Aspects of Diphtheria: A Systematic Review and Pooled Analysis. *Clinical Infectious Diseases*, Volume 71, Issue 1, 1 July 2020, Pages 89–97, <https://doi.org/10.1093/cid/ciz808>
2. Centers for Disease Control and Prevention. Diphtheria Clinical Information. <https://www.cdc.gov/diphtheria/clinicians.html>
3. Centers for Disease Control and Prevention. National Notifiable Disease Surveillance System (NNDSS) Diphtheria (*Corynebacterium diphtheriae*) 2019 Case Definition. <https://ndc.services.cdc.gov/case-definitions/diphtheria-2019/>
4. Sah R, Neupane S. Diphtheria. *New England Journal of Medicine*, September 26, 2019, 381(13):1267.
5. Wilson IE, Menson EN. Cutaneous Diphtheria. *New England Journal of Medicine*, March 29, 2018, 378(13).
6. Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases* (The Pink Book), 14<sup>th</sup> edition (2021).
7. Otshudiema JO, Acosta AM, Cassidy PK, Hadler SC, Hariri S, Tiwari TSP. Respiratory Illness Caused by *Corynebacterium diphtheriae* and *C. ulcerans* and Use of Diphtheria Antitoxin in the United States, 1996–2018. *Clinical Infectious Diseases*, Volume 73, Issue 9, 1 November 2021, Pages e2799–e2806, <https://doi.org/10.1093/cid/ciaa1218>
8. Centers for Disease Control and Prevention. *Vaccine Preventable Diseases* [Diphtheria, Tetanus, and Pertussis Vaccine Recommendations](#).