



Diphtheria

Investigation Guideline

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Revision History:

Date	Replaced	Comments
12/2014	02/2012	Updated Laboratory and Case Management Section. More details added to Investigators Responsibilities and Data Management. Reformatted Standard Case Investigation section to assist with EpiTrax system data entry. Reformatted fact sheet.
02/2012	03/2009	Revised format. Added diphtheria worksheet. Replaced BSE with BEPHI. Added notification section. Removed references to KS-EDSS. Revised case definition with CDC 2010 version.

Diphtheria

Disease Management and Investigative Guidelines

CASE DEFINITION (CDC 2010)

Case Classification:

- **Confirmed:**

An upper respiratory tract illness with an adherent membrane of the nose, pharynx, tonsils, or larynx; and any of the following:

- isolation of *Corynebacterium diphtheriae* from the nose or throat; or
- histopathologic diagnosis of diphtheria; or
- epidemiologic linkage to a laboratory-confirmed case of diphtheria.

- **Probable:**

In the absence of a more likely diagnosis, an upper respiratory tract illness with:

- 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.

Comment: Cutaneous diphtheria should not be reported.

LABORATORY ANALYSIS

Services available from the Kansas Health and Environmental Laboratories (KHEL):

- KHEL is not equipped to test for *C. diphtheriae*.
- KHEL will assist in the forwarding of isolates and specimens to the CDC Diphtheria Laboratory for testing:
 - KHEL's responsibility is to contact the CDC Diphtheria Laboratory and make arrangements for testing.
 - CDC will perform culture, toxigenicity testing, and polymerase chain reaction (PCR) tests on clinical specimens forwarded by KHEL.
 - CDC does not test sera for antibodies to *C. diphtheriae*.
- KHEL will only forward specimens to CDC that have been approved by the KDHE Infectious Disease and Epidemiology Response (IDER) unit.

Because respiratory diphtheria is very uncommon in the US, the medical provider must first review the attached [Checklist for Assessing a Patient with Suspected Diphtheria](#) and consider other agents in the differential diagnosis.

Other biological disease agents which may cause a membranous pharyngitis:

1. Group A β -hemolytic Streptococcus
2. Staphylococcus aureus
3. Arcanobacter hemolyticum
4. Candida albicans
5. Borellia vincenti (Vincent's angina)
6. H. influenzae (acute epiglottitis)
7. Viruses – EBV (Infectious mononucleosis), adenovirus, Herpes simplex
8. Other agents - Toxoplasma

Use of some anti-neoplastic agents may also result in formation of a pharyngeal membrane and the long term use of corticosteroids can cause oral candidiasis.

If respiratory diphtheria is still suspected, the medical provider should contact the KDHE-IDER at 1-877-427-7317, and:

- Institute strict isolation.
- Arrange for antibody testing for diphtheria toxin through a commercial laboratory.
- Arrange for *C. diphtheriae* culture, and toxigenicity testing of any isolates, through a commercial laboratory.
 - Both nasal and pharyngeal swabs should be obtained for culture.
 - If a commercial laboratory cannot assist with the culture and toxigenicity testing, work with KDHE- IDER to use KHEL for forwarding to the CDC's Diphtheria Laboratory for testing.
- Consider treatment with diphtheria toxin (DAT). [*Suspect cases of diphtheria should receive diphtheria antitoxin immediately after bacteriologic specimens are taken without waiting for lab results.*] Refer to guidance in the:
 - Case Management section of this document and
 - CDC's [Use of DAT for Suspected Diphtheria Cases—Protocol](#)
- Arrange with KDHE-IDER for *C. diphtheriae* PCR testing at CDC.
 - Obtain additional clinical specimens for PCR testing when specimens are obtained for culture.
 - Ship specimens to KHEL for forwarding to CDC.
 - CDC will not perform PCR to rule out diphtheria unless diphtheria anti-toxin (DAT) has been requested to treat a patient.

Additional notes on Laboratory Testing:

- Testing of isolates: For *C. diphtheriae* and any other diphtheria toxin-producing *Corynebacterium* species (*C. ulcerans* or *C. pseudotuberculosis*), **CDC requests that all isolates of these types be sent to the CDC Diphtheria Laboratory.**
- Serology: Measurement of serum antibodies to diphtheria toxin before administration of antitoxin helps to assess the probability of diphtheria.
 - <0.01 IU/ml, immunity is likely to be absent
 - >0.1 IU/ml, considered protective and diphtheria is unlikely the cause
 - Levels between 0.01 IU/ml to 0.09 IU/ml, indicate the presence of some or limited immunity
- PCR: If a patient has received antibiotics, PCR can still be used to detect the toxin production gene (dtxR) and the toxin gene (tox). It does not confirm a case for surveillance as the test does not show toxin is being actively produced.

For additional information on laboratory testing for confirmation of diphtheria, see:

- CDC's Diphtheria Laboratory web page: www.cdc.gov/diphtheria/laboratory.html
- CDC's Manual for the Surveillance of Vaccine-Preventable Diseases, [Chapter 22: "Laboratory Support for the Surveillance of Vaccine-Preventable Diseases."](#)

EPIDEMIOLOGY

A disease of colder months in temperate zones, involving primarily non-immunized children less than 15 years of age; however, it can occur in immunized, partially immunized and unimmunized persons but is often less severe in those who are partially or fully immunized. In the U.S., from 1980 to 1992, an average of <4 cases were reported annually; two-thirds of the affected people were 20 years of age or older.

Diphtheria epidemics can occur in susceptible populations. In 1990, for example, a massive outbreak began in the Russia and spread to all countries of the former Soviet Union and Mongolia. Contributing factors included increased susceptibility among adults due to waning of vaccine-induced immunity; and failure fully to immunize children because of unwarranted contraindications, anti-vaccine movements, and declining socioeconomic conditions. After peaking in 1995, the epidemic declined. In Ecuador, an outbreak of about 200 cases occurred in 1993–94; about 50% cases occurred in persons aged 15 years or older. In both epidemics, control was achieved through mass immunization campaigns.

DISEASE OVERVIEW

A. Agent:

Diphtheria is caused by toxin-producing biotypes of *C. diphtheriae*, a gram-positive bacillus. The 4 biotypes, in order of likelihood of producing toxin, are: *gravis*, *mitis*, *intermedius*, and *belfanti*.

B. Clinical Description:

A toxin mediated, upper respiratory tract illness characterized by sore throat, low-grade fever, and an adherent grayish membrane of the tonsil(s), pharynx, and/or nose. Symptoms also include large tender cervical lymph nodes, and marked swelling and edema of neck ("bull neck"). Upper airway obstructions may be caused by extensive membrane formation. Late effects of the toxin include cranial and peripheral motor and sensory nerve palsies, myocarditis, and nephropathy. Cutaneous diphtheria usually appears as a localized ulcer.

C. Reservoirs:

Humans are the only reservoir of *C. diphtheria*.

D. Mode(s) of Transmission:

Person-to-person transmission by droplets or through direct contact with the nasopharyngeal secretions of an infected person. Fomites and raw milk may serve as a vehicle of transmission.

E. Incubation Period:

Average, 2-5 days; occasionally longer.

F. Period of Communicability:

Transmission may occur as long as virulent bacilli are present in discharges and lesions. Usually < 2 weeks and rarely > 1 month. Effective antibiotic therapy can reduce communicability to < 4 days. Carriers may shed organisms for ≥ 6 months.

G. Susceptibility and Resistance:

Infants born of immune mothers are relatively immune; protection is usually lost before the 6th month. Lifelong immunity is usually, but not always, acquired after infection. Prolonged active immunity can be induced by toxoid.

H. Treatment: **

- Suspect cases of diphtheria should receive diphtheria antitoxin immediately after bacteriologic specimens are taken without waiting for lab results.
- In addition, appropriate antibiotic therapy with erythromycin or penicillin should be given in conjunction with antitoxin to eradicate the organism and reduce the period of communicability.
- Antibiotics are not a substitute for the antitoxin which is the primary treatment.

NOTIFICATION TO PUBLIC HEALTH AUTHORITIES

Diphtheria shall be designated as infectious or contagious in their nature, and cases or suspect cases shall be reported within seven days**:

1. Health care providers and hospitals: report to local health jurisdiction
2. Laboratories: report to KDHE - BEPHI
3. Local health jurisdiction: report to KDHE - BEPHI

**Kansas Department of Health and Environment (KDHE)
Bureau of Epidemiology and Public Health Response (BEPHI)
Phone: 1-877-427-7317 Fax: 1-877-427-7318**

** Suspected diphtheria cases should be reported promptly by telephone to CDC so that diphtheria antitoxin can be obtained for the patient.

- U.S. physicians caring for patients with suspected respiratory diphtheria can obtain DAT by contacting the CDC's Emergency Operations Center at 770-488-7100. The diphtheria duty officer at CDC's Meningitis and Vaccine Preventable Diseases Branch (MVPDB) in the Division of Bacterial Diseases (DBD) of the National Center for Immunization and Respiratory Diseases (NCIRD) will discuss the case and protocol for DAT release with the physician.

Further responsibilities of state and local health departments to the CDC:

As a nationally notifiable condition, all cases even before classification require an IMMEDIATE, EXTREMELY URGENT report to the Center of Disease Control and Prevention (CDC).

1. IMMEDIATE, URGENT reporting requires a KDHE epidemiologist to call the CDC EOC at 770-488-7100 within 24 hours of a case being reported, followed by submission of an electronic case notification in next regularly scheduled electronic transmission.
 - KDHE-BEPHI will notify the CDC immediately by phone of all confirmed or suspected cases and will file electronic reports weekly with CDC.
2. **Local public health jurisdiction** will report information requested on the supplemental form as soon as possible, completing the form within 7 days of receiving a notification of a report.

INVESTIGATOR RESPONSIBILITIES

- 1) [Report](#) all confirmed, probable and suspect cases to the KDHE.
- 2) Contact medical provider to collect additional information and confirm diagnosis using the current case definition.
 - Collect all information requested in [Step 1](#)) of case investigation.
 - Ensure that the patient is aware of his/her diagnosis.
- 3) Conduct [case investigation](#) to identify potential source of infection.
- 4) Conduct [contact investigation](#) to locate additional cases and/or contacts.
- 5) Identify whether the source of infection is major public health concern,
 - Involvement of a high-risk occupation or if another special situation is involved. (i.e., daycare, health care).
 - Under-immunized population within the community.
- 6) Initiate control and prevention measures to prevent spread of disease.
 - Culturing of contacts, prophylaxis, vaccinations, and restrictions.
- 7) [Record](#) data, collected during the investigation, in the KS EpiTrax system under the data's associated [\[tab\]](#) in the case morbidity report (CMR).
- 8) As appropriate, use the disease [fact sheet](#) to notify individuals or groups.

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Case Investigation

- 1) Contact the medical provider who ordered testing and obtain the following information. (This includes medical records for hospitalized patients.)
 - Obtain clinical information on:
 - Date of illness onset [\[Clinical\]](#)
 - Date diagnosed-presumptive [\[Clinical\]](#)
 - Date of final diagnosis, what was diagnosed, and how was the final diagnosis confirmed. [\[Clinical\]](#)
 - Symptoms & signs: fever, sore throat, difficulty swallowing, change in voice, shortness of breath, weakness, fatigue, membrane present (specify anatomical site of membrane), soft tissue swelling around membrane, neck edema (specify: bilateral or side of swelling and extent of swelling), stridor, wheezing, palatal weakness, tachycardia, and EKG abnormalities) [\[Investigation-Symptoms\]](#)
 - Complications and date of complication onset: airway obstruction, myocarditis, polyneuritis, or other (describe) [\[Investigation-Complications\]](#)
 - Examine the laboratory testing that was done, especially:
 - o Culture, biotype and toxigenicity test, PCR, molecular typing.
 - Determine if further laboratory testing is needed.
 - o If not done, coordinate testing for symptomatic, highly suspected cases.
 - Request history of immunization against diphtheria, post-vaccine antibody titers, or information on why the patient, if less than 18 years of age, is not immunized or fully immunized. [\[Investigation-Vaccination History\]](#)
 - If not available from the medical records, attempt to collect the information from another credible source.

- Collect patient’s demographics and contacting information (address, birth date, gender, race/ethnicity, primary language, and phone number(s)) [Demographic]
 - Record hospitalizations: location, duration of stay, and reason [Clinical]
 - Record treatment, including: [Clinical]
 - Antibiotics prescribed, date started and duration of therapy [Clinical]
 - DAT administration, including amount antitoxin [Investigation-Follow Up]
 - Record outcomes: “Recovered, no residual”, “Recovered, residual”, or Death (with date of death) [Clinical]
- 2) Interview the patient to determine source, risk factors and transmission settings.
- Travel History:
 - If not US resident, record date of US arrival. [Investigation-Exposure]
 - Record any travel outside of Kansas 14 days before illness began; specify whether travel was inside the US and/or international (include dates and locations) [Investigation-Exposure]
 - Noting travel dates and locations record where the infection was most likely imported from. (Indigenous / out-of-county, state, or U.S.) [Epidemiological]
 - Investigate potential exposures: [Investigation-Exposure]
 - Exposure to diphtheria case or carrier; include dates and locations
 - Exposure to international travelers; include dates and locations
 - Exposure to immigrants; include dates and locations
 - Examine potential transmission settings, include:
 - Patient’s occupation: food handler, health care worker, group living, day care attendee / worker, or school attendee / employee; specifically list patient’s occupation [Epidemiological]
 - Obtain name of school and grade of patient (if applicable).
 - Examining occupation, record any Place Exposure(s) (where illness could have been transmitted). [Epidemiological]
- 3) Collect information from case for the [Contact Investigation](#). (See below).
- 4) Investigate epi-links among cases (clusters, household, co-workers, etc).
- If the patient had contact with person(s) who have/had diphtheria, determine if the other “cases” have been reported to the state:
 - Search the state electronic surveillance for the possible case.
 - If found, record the previously reported record number in the record of the case you are investigating [Notes]
 - Highly suspected illness in persons that have not previously been reported should be investigated as a suspect case and [reported](#) to KDHE-BEPHI:
 - Enter the symptomatic contact of the case on the [Contact] Tab of the CMR and save.
 - After the CMR has updated successfully, click ‘Show’ beside the contact on the listing.
 - With the [View Contact](#) open in show mode, select ‘Promote to CMR’; update, as needed.
 - For suspected [Outbreaks](#) refer to Managing Special Situations section.

Contact Investigation

- 1) Review the patient's occupation and activities collected during the Case Investigation and recorded on [\[Epidemiological\]](#) and [\[Investigation-Exposure\]](#) tabs:
 - Examine activities from onset date to 2 weeks after onset. (The period can be shortened to 4 days after the completion of antibiotic therapy if therapy was considered effective.)
 - Verify patient's household address and telephone number(s) [\[Demographics\]](#)
 - Verify addresses of places of exposure, dates the patient was at the location, and ways to identify potential contacts at the locations. [\[Epidemiological\]](#)
 - Consider the locations the patient sought medical care.) [\[Clinical\]](#)
- 2) Consider the following types of contacts during the contact investigation:
 - Household members or those who regularly visit the home.
 - Other persons with a history of direct contact with a case-patient in manner that would have allowed exposure to oral or respiratory secretions. (e.g. caretakers or relatives)
 - Medical staff exposed to oral or respiratory secretions of a case-patient.
- 3) Create a line listing of contacts. [\[Contact\]](#)
 - Obtain name, address, and telephone of contacts
 - Collect contact's immunization status and any diphtheria symptoms
 - Collect information on the contact's occupation.
 - Note any school or daycare attendance. (Include facility name and location.)
 - Note any healthcare associations. (Include facility name and location)
 - Note any high risk contacts.
- 4) Follow-up symptomatic contacts as suspect cases.
 - Report and manage as diphtheria case and refer for medical care. *(On the [\[Contact\]](#) Tab of the CMR, click 'Show' beside the contact on the listing. When View Contact Event opens in show mode, select 'Promote to CMR.')*
 - A contact meeting the clinical case definition is considered a confirmed case if epi-linked to a laboratory confirmed case.
 - If a symptomatic contact is laboratory confirmed – the primary case that was not laboratory confirmed is confirmed based on the epi-link.
- 5) [Institute control measures](#) for infected persons, food handlers, and school or day-care contacts.
- 6) Follow-up with household and close contacts (especially high risk contacts) as recommended under [Contact Management](#).

Isolation, Work and Daycare Restrictions

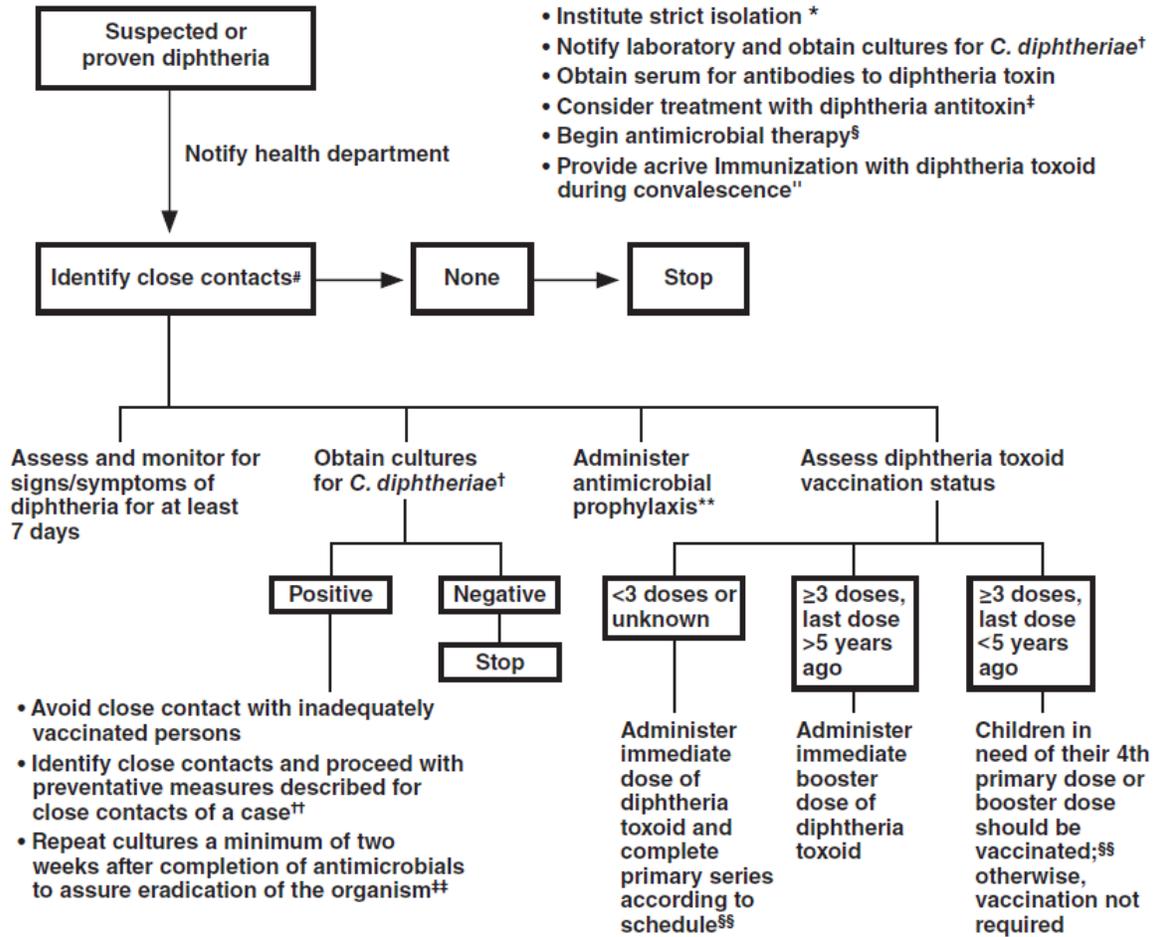
K.A.R 28-1-6 for Diphtheria:

- Each infected person shall remain in isolation for 14 days or until two consecutive negative pairs of nose and throat cultures are obtained at least 24 hours apart and not less than 24 hours after discontinuation of antibiotic therapy.
- Each household contact and all other close contacts shall have nose and throat specimens tested and be monitored for symptoms for seven days from the time of last exposure to the disease.
- Healthy carriers with diphtheria shall be treated.
- Each contact who is a food handler or works with children shall be excluded from that occupation until the nose and throat cultures are negative.

Case Management

- 1) Prompt administration of diphtheria antitoxin is important.
 - Diphtheria antitoxin is currently available only through the CDC under an FDA-approved Investigational New Drug protocol; important epidemiologic and clinical data are needed prior to its release.
 - Physicians caring for patients with suspected respiratory diphtheria can obtain DAT by contacting the CDC's Emergency Operations Center at 770-488-7100. The diphtheria duty officer will discuss the case and protocol for DAT release with the physician.
 - KDHE disease reporting hotline (877-427-7317) should be contacted to assist with any laboratory specimens that will be sent to the CDC.
 - Patients should be tested for sensitivity to horse serum and, if necessary, desensitized before administration of the antitoxin.
 - The recommended dosage and route of administration depends on the extent and duration of disease; refer to the package insert.
- 2) Antimicrobial therapy (penicillin or erythromycin) is not a substitute for antitoxin treatment but is administered to eradicate the organism, prevent further production of toxin and decrease chance of further transmission.
- 3) Strict isolation for two weeks or until two consecutive sets of nose and throat swabs, collected >24 hours apart, are culture negative for *C. diphtheriae*.
 - With antimicrobial therapy, the first specimens are taken at ≥ 24 hours from the completion of antimicrobial therapy.
 - If illness onset was ≥ 2 weeks prior and symptoms have resolved without antimicrobial therapy, collect the first specimens for culture immediately.
 - If both sets of cultures are negative, the individual is free of infection.
- 4) If a repeat culture is positive, an additional 10-day course of oral erythromycin is administered with follow-up cultures again repeated as described.
- 5) Provide active immunization with diphtheria toxoid during convalescence, as disease does not confer immunity.
- 6) Record whether or not DAT was administered. [Investigation-Exposure]
- 7) Conduct a follow-up as needed to assure compliance with control measures.
- 8) Conduct a follow-up interview to determine outcome of illness. [Clinical]
- 9) As an additional reference, see [Figure 1](#).

Figure 1. Respiratory Diphtheria: Recommendations for Case Management and Investigation of Close Contacts



* Maintain isolation until elimination of the organism is demonstrated by negative cultures of two samples obtained at least 24 hours apart after the completion of antimicrobial therapy.

† Both nasal and pharyngeal swabs should be obtained for culture.

‡ Contact the state health department to make arrangements for antitoxin from the CDC.

§ Antimicrobial therapy is not a substitute for antitoxin treatment in clinical diphtheria but may eliminate the organism. Procaine penicillin G or parenteral erythromycin is used until patient can swallow comfortably, and then oral erythromycin or oral penicillin V is used.

" Vaccination is required because clinical diphtheria does not necessarily confer immunity.

Close contacts include household members and other persons with a history of direct contact with a case-patient (e.g. caretakers, relatives, or regular visitors to home) and medical staff exposed to oral or respiratory secretions of the case-patient.

** Prophylaxis includes a single dose of benzathine penicillin G or a 7- to 10- day course of oral erythromycin.

†† Preventive measures may extend to close contacts of carriers but should be a lower priority than control measures for contacts of a case.

‡‡ Persons who continue to harbor the organism after treatment with either penicillin or erythromycin should receive an additional 10-day course of oral erythromycin and should submit samples for follow-up cultures.

§§ Refer to published recommendations for the schedule for routine administration of DTP. (Source: Appendix 2-6 of the CDC Manual for the Surveillance of Vaccine-Preventable Diseases)

Contact Management

- 1) Maintain [notes](#) on all contacts: symptoms screenings, immunization histories, culture results, prophylaxis recommended/completed (antibiotics and booster doses), and the disposition of the contact after 10 days of active surveillance, including any missing or gone explanations (MOGE). [[Contact-Edit Contact](#)]
- 2) Obtain specimens for culture from contacts:
 - Cultures taken from the nose and throat of all contacts.
 - Those who handle food or work with children shall be excluded until nose and throat cultures are negative
- 3) Antibiotic prophylaxis of contacts initiated:
 - After specimens for culture are collected.
 - Regardless of contact's immunization status, recommend a single dose of benzathine penicillin or a 7-10 day course of erythromycin.
 - Single penicillin dose is used when the contact's compliance in doubt.
- 4) Assess diphtheria toxoid vaccination status of contacts:
 - Previously immunized contacts should receive a booster dose of diphtheria toxoid if >5 years have elapsed since their last dose.
 - Non-immunized contacts (those with <3 doses or unknown histories) should begin and/or continue with a primary series according to published recommendations for routine immunizations.
 - Report any adverse event that occurs after the administration of a vaccine to Vaccine Adverse Events Reporting System at <http://vaers.hhs.gov/index>
- 5) Assess and monitor contacts (active surveillance) for signs and symptoms of diphtheria for 10 days after last contact with an infectious case.
 - Symptomatic contacts are treated as suspect cases. (see [Step 6](#))
 - Asymptomatic contacts that are culture-positive are carriers, not cases. (See [Step 7](#))
- 6) Management of culture-positive secondary cases (symptomatic contacts):
 - Treat and manage as described in [Case Management](#), including the strict isolation for two weeks or until two consecutive sets of nose and throat swabs, collected >24 hours apart, are culture negative for *C. diphtheriae*.
- 7) Management of carriers:
 - Assure antimicrobial treatment is received to eradicate the organism.
 - Instruct carriers to isolate themselves from situations that could result in close contact with inadequately vaccinated persons until after successful treatment is received eradicating the organism.
 - To assure eradication: \geq 24 hours after the completion of antimicrobial prophylaxis, repeat cultures with two consecutive sets of nose and throat swabs, collected >24 hours apart with the second set collected at a minimum of two weeks after the antibiotic treatment.
 - If any culture is positive, an additional 10-day course of oral erythromycin should be administered with the cultures then repeated.
 - Close contacts of carriers should proceed with the preventive measures described for the close contacts of cases but:
 - Assign close contacts of persons with clinical diphtheria highest priority.
 - Contacts of carriers should be given secondary priority.

Note: The risk of developing diphtheria is sevenfold higher after household exposure to clinical diphtheria case than after household exposure to a carrier.

- 8) Active surveillance for suspect cases in the affected settings should take place for at least 2 incubation periods (10 days).

Environmental

- Disinfect fomites and discharges from lesions.
- Use pasteurized milk.

Education

- 1) Provide education that includes basic information about the disease and its complications and ways to treat and prevent transmission of illness.
- 2) Instruct cases on the necessary isolation.
- 3) Cases, carriers and contacts should be instructed to pay strict attention to personal hygiene by:
 - Covering nose and mouth with tissue when coughing.
 - Placing all contaminated tissues directly into garbage containers.
 - Washing hands with soap and water every time there is contact with respiratory secretions or infected wounds.
- 4) Instruct cases and contacts to be aware of the high risk that infection poses to certain individuals, especially unvaccinated or inadequately vaccinated persons such as infants under 2 months of age.
- 5) Counsel contacts to watch for signs or symptoms for 10 days after exposure.
 - Should symptoms develop, medical care should be sought promptly and appropriate specimens taken. Treatment should be considered for persons with any of the signs or symptoms that are compatible with pertussis.

MANAGING SPECIAL SITUATIONS

A. Outbreak Investigation:

- A single case of suspected diphtheria should be treated with urgency.
- Notify KDHE immediately, 1-877-427-7317.
- Active case finding will be an important part of any investigation; especially when there is no history of international travel or contact with visitors who have been to a area endemic for diphtheria.
- All epidemiologic data will be reported and managed through the Kansas outbreak module of the electronic surveillance system.
- Recommendations will be made based on the [CDC's Manual for the Surveillance of Vaccine-Preventable Diseases](#).

DATA MANAGEMENT AND REPORTING TO THE KDHE

- A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the **[Administrative]** tab.
- B. Organize and collect data, using appropriate questionnaires, case listings (spreadsheets), and investigation forms, including the [Diphtheria Investigation Worksheet](#) and [Diphtheria Contact Investigation Worksheet](#).
 - Investigators can collect and enter all required information directly into EpiTrax **[Investigation]**, **[Clinical]**, **[Demographics]**, and **[Epidemiological]** tabs without using the paper forms.
 - During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.
- C. Report data collected during the course of the investigation via EpiTrax.
 - Verify that all data requested on the applicable forms has been recorded on an appropriate EpiTrax **[tab]**, or that actions are completed for a case lost to follow-up as outlined below.
 - Some data that cannot be reported on an EpiTrax **[tab]** may need to be recorded in **[Notes]** or scanned and attached to the record.
 - Paper report forms do not need to be sent to KDHE after the information is recorded in EpiTrax. The forms should be handled as directed by local administrative practices.
- D. If a case is lost to follow-up, after the appropriate attempts to contact the case have been made:
 - Indicate 'lost to follow-up' on the **[Investigation]** tab with the number of attempts to contact the case recorded.
 - Record at least the information that was collected from the medical records.
 - Record a reason for 'lost to follow-up' in **[Notes]**.
- E. Once the investigation is completed, the LHD investigator will click the "Complete" button. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
 - The LHD Administrator will then "Approve" or "Reject" the CMR.
 - Once a case is "Approved" by the LHD Administrator, BEPHI staff will review the case to ensure completion before closing the case.
- F. Review the [EpiTrax User Guide, Case Routing](#) for further guidance

ADDITIONAL INFORMATION / REFERENCES

- A. **Treatment / Differential Diagnosis:** American Academy of Pediatrics. Red Book: Report of the Committee on Infectious Disease, 29th Edition. Illinois, Academy of Pediatrics, 2014.
- B. **Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual, Washington, DC, American Public Health Association, 2010.
- C. **Case Definitions:** wwwn.cdc.gov/nndss/
- D. **Quarantine and Isolation:** Kansas Community Containment Isolation/ Quarantine Toolbox Section III, Guidelines and Sample Legal Orders www.kdheks.gov/cphp/operating_guides.htm#coc
- E. **Kansas Regulations/Statutes Related to Infectious Disease:** www.kdheks.gov/epi/regulations.htm
- F. **Pink Book:** Epidemiology and Prevention of Vaccine-Preventable Diseases. Available at: www.cdc.gov/vaccines/pubs/pinkbook/index.html
- G. **Manual for the Surveillance of Vaccine-Preventable Diseases:** Available at: www.cdc.gov/vaccines/pubs/surv-manual/index.html.
- H. **Additional Information (CDC):** www.cdc.gov/health/default.htm

ATTACHMENTS

To view attachments in the electronic version:

1. Go to <View>; <Navigation Pane>; <Attachments> – OR – Click on the “Paper Clip”  icon at the left.
2. Double click on the document to open.

CDC Diphtheria Worksheet

PATIENT INFORMATION	Date of Request <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>		Name (Last, First)					
	Birth Date <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>		Age <input type="text"/> <input type="text"/> <input type="text"/> <small>Unk = 999</small>	Age Type <input type="checkbox"/> 0 = 0-120 years <input type="checkbox"/> 1 = 0-11 months <input type="checkbox"/> 2 = 0-52 weeks <input type="checkbox"/> 3 = 0-28 days <input type="checkbox"/> 9 = Age unknown	Sex <input type="checkbox"/> M = Male <input type="checkbox"/> F = Female <input type="checkbox"/> U = Unknown	Pregnant? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Race <input type="checkbox"/> N = Native Amer./Alaskan Native <input type="checkbox"/> A = Asian/Pacific Islander <input type="checkbox"/> B = African American <input type="checkbox"/> W = White <input type="checkbox"/> O = Other <input type="checkbox"/> U = Unknown	Ethnicity <input type="checkbox"/> H = Hispanic <input type="checkbox"/> N = Not Hispanic <input type="checkbox"/> U = Unknown
	Address (Street and No.)			County		State	Zip	Phone
	Date Symptom Onset <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	Date First Diagnosis <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	Date Hospitalized <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	History of Immunization Against Diphtheria Childhood Primary Series? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown		If < 18 Years Old, Number of Doses <input type="text"/>	Boosters as Adult? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Date of Last Dose <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small> OR <input type="checkbox"/> U = Unk
Description of Clinical Picture							Outcome <input type="checkbox"/> N = Recovered, No Residua <input type="checkbox"/> R = Recovered, Residua <input type="checkbox"/> D = Died <input type="checkbox"/> U = Unknown	

CLINICAL INFORMATION	<i>Enter Y = Yes, N = No, or U = Unknown in the Boxes Below Unless Otherwise Indicated</i>						
	Symptoms Fever? <input type="checkbox"/> Sore Throat? <input type="checkbox"/> Difficulty Swallowing? <input type="checkbox"/> Change in Voice? <input type="checkbox"/> Shortness of Breath? <input type="checkbox"/> Weakness? <input type="checkbox"/> Fatigue? <input type="checkbox"/> Other? <input type="checkbox"/>		Signs Fever? <input type="checkbox"/> If Yes, Temp <input type="text"/> <input type="text"/> <input type="text"/> °C Membrane? <input type="checkbox"/> If Yes, Site(s) <input type="text"/> Tonsils <input type="checkbox"/> Soft Palate <input type="checkbox"/> Hard Palate <input type="checkbox"/> Larynx <input type="checkbox"/> Nares <input type="checkbox"/> Nasopharynx <input type="checkbox"/> Conjunctiva <input type="checkbox"/> Skin <input type="checkbox"/>		Soft Tissue Swelling? <input type="checkbox"/> <small>(Around Membrane)</small> Neck Edema? <input type="checkbox"/> If Yes <input type="checkbox"/> B = Bilateral <input type="checkbox"/> L = Left Side Only <input type="checkbox"/> R = Right Side Only If Yes, Extent <input type="checkbox"/> S = Submandibular Only <input type="checkbox"/> M = Midway to Clavicle <input type="checkbox"/> C = To Clavicle <input type="checkbox"/> B = Below Clavicle Stridor? <input type="checkbox"/> Wheezing? <input type="checkbox"/> Palatal Weakness? <input type="checkbox"/> Tachycardia? <input type="checkbox"/> EKG Abnormalities? <input type="checkbox"/>		Complications Complications? <input type="checkbox"/> Airway Obstruction? <input type="checkbox"/> Date of Onset <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small> Intubation Required? <input type="checkbox"/> Myocarditis? <input type="checkbox"/> Date of Onset <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small> (Poly)neuritis? <input type="checkbox"/> Date of Onset <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small> Other? <input type="checkbox"/> Describe:

LABORATORY	Specimen for Diphtheria Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	If Yes, Obtained on <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small> OR <input type="checkbox"/> U = Unknown	Culture Result <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown	Specify Lab Performing Culture:	If Culture Positive, Biotype <input type="checkbox"/> M = Mitis <input type="checkbox"/> G = Gravis <input type="checkbox"/> I = Intermedius <input type="checkbox"/> B = Belfanti
	If Culture Positive, Results of Toxicogenicity Testing <input type="checkbox"/> X = Not Done <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown	Specimen Sent to CDC Diphtheria Lab for Confirmation/Molecular Typing? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> W = Will be Sent	Type of Specimen (Check All That Apply) <input type="checkbox"/> Clinical Swab <input type="checkbox"/> Piece of Membrane <input type="checkbox"/> C. diphtheria Isolate	Serum Specimen for Diphtheria Antitoxin Antibodies Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> W = Will be Obtained Prior to DAT	PCR Result <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown <input type="checkbox"/> X = Not Done

ANTIBIOTICS	Treated with Antibiotics? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No	As an Outpatient If Yes, Date Initiated <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	Antibiotic <input type="checkbox"/> See Codes Below	Duration of Therapy <input type="text"/> <input type="text"/> Days	Antibiotic Therapy in Hospital? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No	As an Inpatient If Yes, Date Initiated <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	Antibiotic <input type="checkbox"/> See Codes Below	Duration of Therapy <input type="text"/> <input type="text"/> Days
	Were Antibiotics Given in the 24 Hours Before Culture? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	1 = Erythromycin (Incl. Pediazole, Ilosone) 2 = Penicillin (Bicillin, Pfizerpen-AS, Wycillin) 3 = Amoxicillin/Ampicillin/Augmentin/Ceclor/Cefixime 4 = Clarithromycin/azithromycin	5 = Cotrimoxazole (Bactrim/Septtra) 6 = Tetracycline/Doxycycline 7 = Other 9 = Unknown					

EXPOSURE	Country of Residence <input type="checkbox"/> U = US <input type="checkbox"/> O = Other		If Other, Country Name: _____		Date of US Arrival <input type="text"/> <input type="text"/> <input type="text"/> OR <input type="checkbox"/> <small>Month Day Year U = Unknown</small>																														
	History of International Travel? (2 Weeks Prior to Onset) <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Country(s) Visited <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="border: none;"></th> <th colspan="3" style="border: none;">From</th> <th colspan="3" style="border: none;">To</th> </tr> <tr> <th style="border: none;"></th> <th style="border: none;">Month</th> <th style="border: none;">Day</th> <th style="border: none;">Year</th> <th style="border: none;">Month</th> <th style="border: none;">Day</th> <th style="border: none;">Year</th> </tr> </thead> <tbody> <tr> <td style="border: none;">_____</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> <tr> <td style="border: none;">_____</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> </tbody> </table>							From			To				Month	Day	Year	Month	Day	Year	_____							_____						
		From			To																														
	Month	Day	Year	Month	Day	Year																													

History of Interstate Travel? (2 Weeks Prior to Onset) <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	State(s) Visited <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="border: none;"></th> <th colspan="3" style="border: none;">From</th> <th colspan="3" style="border: none;">To</th> </tr> <tr> <th style="border: none;"></th> <th style="border: none;">Month</th> <th style="border: none;">Day</th> <th style="border: none;">Year</th> <th style="border: none;">Month</th> <th style="border: none;">Day</th> <th style="border: none;">Year</th> </tr> </thead> <tbody> <tr> <td style="border: none;">_____</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> <tr> <td style="border: none;">_____</td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> </tbody> </table>							From			To				Month	Day	Year	Month	Day	Year	_____							_____							
	From			To																															
	Month	Day	Year	Month	Day	Year																													

Known Exposure to Diphtheria Case or Carrier? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Known Exposure to International Travelers? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Known Exposure to Immigrants? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown
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REPORTING INFORMATION	Has This Suspected Case Been Reported to The State or Local Health Department? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Date Reported to State or Local Health Department <input type="text"/> <input type="text"/> <input type="text"/> <small>Month Day Year</small>	
	Person Informed: _____	Phone <input type="text"/> - <input type="text"/> - <input type="text"/>	Fax <input type="text"/> - <input type="text"/> - <input type="text"/>
	Reporting Physician: _____	Phone <input type="text"/> - <input type="text"/> - <input type="text"/>	Fax <input type="text"/> - <input type="text"/> - <input type="text"/>

REQUESTING PHYSICIAN	Name		
	Institution		
	Street		
	City	State	Zip
	Phone <input type="text"/> - <input type="text"/> - <input type="text"/>	Fax <input type="text"/> - <input type="text"/> - <input type="text"/>	
	Name of Investigator Under the IND (If Different From Requesting Physician)	Phone <input type="text"/> - <input type="text"/> - <input type="text"/>	Fax <input type="text"/> - <input type="text"/> - <input type="text"/>

SEND DRUG TO	Name		
	Attn.		
	Institution		
	Street		
	City	State	Zip
	Phone <input type="text"/> - <input type="text"/> - <input type="text"/>	Fax <input type="text"/> - <input type="text"/> - <input type="text"/>	

DOSE	Amount of DAT Administered: <input type="text"/> <input type="text"/> , <input type="text"/> <input type="text"/> IU DAT
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DISPOSITION	Final Diagnosis: _____	How Was the Final Diagnosis Confirmed? _____	Final Case Disposition <input type="checkbox"/> C = Confirmed <input type="checkbox"/> P = Probable <input type="checkbox"/> N = Not a Case

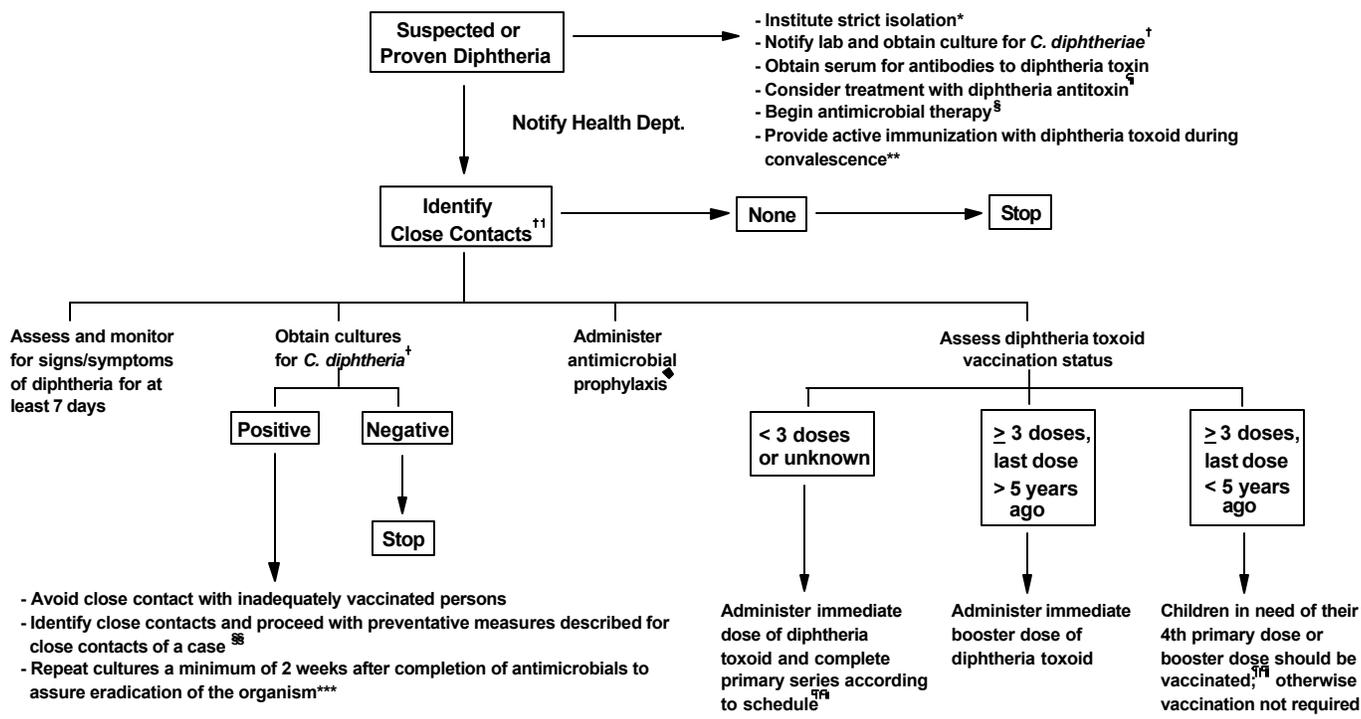
Information for Close Contacts* Diphtheria

*Close Contact = Household members and others with a history of direct contact with a case-patient, and medical staff exposed to oral or respiratory secretions of a case-patient.

CONTACT INFORMATION	Name _____	Age _____	Relation to Case _____					
	Vaccinated? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	If Vaccinated, Number of Lifetime Doses <input type="checkbox"/> U = Unknown <input type="checkbox"/> L = < 3 Doses <input type="checkbox"/> G = ≥ 3 Doses	If Vaccinated, Last Dose <input type="checkbox"/> L = ≤ 5 Years Ago <input type="checkbox"/> G = > 5 Years Ago	Nasopharyngeal Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Oropharyngeal (Throat) Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Date of Culture <input type="text"/> / <input type="text"/> / <input type="text"/> Month Day Year	Results <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown	Antibiotic Prophylaxis <input type="checkbox"/> See Codes Below
	Name _____	Age _____	Relation to Case _____					
	Vaccinated? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	If Vaccinated, Number of Lifetime Doses <input type="checkbox"/> U = Unknown <input type="checkbox"/> L = < 3 Doses <input type="checkbox"/> G = ≥ 3 Doses	If Vaccinated, Last Dose <input type="checkbox"/> L = ≤ 5 Years Ago <input type="checkbox"/> G = > 5 Years Ago	Nasopharyngeal Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Oropharyngeal (Throat) Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Date of Culture <input type="text"/> / <input type="text"/> / <input type="text"/> Month Day Year	Results <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown	Antibiotic Prophylaxis <input type="checkbox"/> See Codes Below
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	Name _____	Age _____	Relation to Case _____					
	Vaccinated? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	If Vaccinated, Number of Lifetime Doses <input type="checkbox"/> U = Unknown <input type="checkbox"/> L = < 3 Doses <input type="checkbox"/> G = ≥ 3 Doses	If Vaccinated, Last Dose <input type="checkbox"/> L = ≤ 5 Years Ago <input type="checkbox"/> G = > 5 Years Ago	Nasopharyngeal Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Oropharyngeal (Throat) Culture Obtained? <input type="checkbox"/> Y = Yes <input type="checkbox"/> N = No <input type="checkbox"/> U = Unknown	Date of Culture <input type="text"/> / <input type="text"/> / <input type="text"/> Month Day Year	Results <input type="checkbox"/> P = Positive <input type="checkbox"/> N = Negative <input type="checkbox"/> U = Unknown	Antibiotic Prophylaxis <input type="checkbox"/> See Codes Below

- | | |
|--|----------------------|
| 1 = Erythromycin (incl. Pediazole, ilosone)
(bactrim/sepra) | 5 = Cotrimoxazole |
| 2= Penicillin (Bicillin, Pfizerpen-AS, Wycillin)
Tetracycline/Doxycycline | 6 = Antibiotic Codes |
| 3 = Amoxicillin/Ampicillin/Augmentin/Ceclor/Cefixime | 7 = Other |
| 4 = Clarithromycin/azithromycin | 9 = Unknown |

Note: This Form has 2 Sides



*Maintain isolation until elimination of the organism is demonstrated by negative cultures of two samples obtained at least 24 hours apart after completion of antimicrobial therapy.

† Both nasal and pharyngeal swabs should be obtained for culture.

†† If equine diphtheria antitoxin is needed, contact your State Health Department. Before administration, patients should be tested for sensitivity to horse serum and, if necessary, desensitized. The recommended dosage and route of administration depend on the extent and duration of disease.

‡ Detailed recommendations can be obtained from the package insert and other publications.

§ Antimicrobial therapy is not a substitute for antitoxin treatment. Intramuscular procaine penicillin G (25,000-50,000 units/[kg/d] for children and 1.2 million units/d for adults, in two divided doses) or parenteral erythromycin (40-50 mg/[kg/d], with a maximum of 2 g/d) has been recommended until the patient can swallow comfortably, at which point oral erythromycin in four divided doses or oral penicillin V (125-250 mg four times daily) may be substituted for a recommended total treatment period of 14 days.

**Vaccination is required because clinical diphtheria does not necessarily confer immunity.

Close contacts include household members and other persons with a history of direct contact with a case-patient (e.g. caretakers, relatives, or friends who regularly visit the home) as well as medical staff exposed to oral or respiratory secretions of a case-patient.

◆ A single dose of intramuscular benzathine penicillin G (600,000 units for persons < 6 years of age and 1.2 million units for persons ≥ 6 years of age) or a 7- to 10-day course of oral erythromycin (40mg/[kg/d] for children and 1 g/d for adults) has been recommended.

Preventative measures may be extended to close contacts of carriers but should be considered a lower priority than control measures for contacts of each case.

***Persons who continue to harbor the organism after treatment with either penicillin or erythromycin should receive an additional 10-day course of oral erythromycin and should submit samples for follow-up cultures.

Refer to published recommendations for the schedule for routine administration of DTP.
Farizo KM, Strebel PM, Chen RT, et al. Fatal respiratory disease due to *Corynebacterium diphtheriae*: Case report and review of guidelines for management, investigation, and control. Clin Infect Dis 1993;16:59-68. Centers for Disease Control and Prevention. Manual for the Surveillance of Vaccine-Preventable Diseases 1996;2-9.