

# Pertussis

## PROTOCOL CHECKLIST

- Enter available information into Merlin upon receipt of initial report
- Review background on disease, case definition and laboratory testing
- Contact provider to acquire medical records and laboratory results
- Evaluate if the case meets case definition, or is clinically compatible with pertussis
- Interview patient, family or guardian
  - Paper case report form (CRF) is recommended for data collection
  - Review disease facts
    - Modes of transmission
    - Incubation period
    - Symptoms/types of infection
  - Discuss risk factors for pertussis
    - Exposure to contact with documented or suspected cough illness
    - Contact with unvaccinated or partially vaccinated patient
    - Patient with immunocompromised state – HIV, sickle cell, asplenia, malignancy
    - Determine pertussis vaccination history
  - Identify possibly exposed close contacts and family members
    - Prioritize close contacts at risk for severe disease (infants, pregnant women and immune-compromised persons)
    - Recommend prophylaxis for close contacts as appropriate
    - Determine whether patient or symptomatic contact is in a sensitive situation (daycare, health care facility, etc.)
    - Recommend exclusion for patients or symptomatic contacts
    - Provide education on prevention through vaccination and prophylaxis as indicated
  - Address patient and family's questions or concerns
- Follow-up on special situations, including exposed contacts or patients in sensitive situations, to recommend appropriate control measures and conduct active surveillance for additional cases.
- Enter additional data obtained from interview into Merlin

## Pertussis

### 1. DISEASE REPORTING

#### A. Purpose of reporting and surveillance

1. To prevent illness and death among high-risk persons and among persons who may transmit pertussis to high-risk persons.
2. To identify and evaluate contacts and recommend appropriate prevention measures, including exclusion, antibiotic prophylaxis and immunization.
3. To educate exposed persons about signs and symptoms of disease, thereby facilitating early diagnosis and treatment and preventing further spread.
4. To vaccinate exposed, underimmunized children.
5. To monitor the epidemiology of pertussis in Florida.

#### B. Legal reporting requirements

Laboratories and physicians are required to report cases to the local county health department (CHD) immediately 24/7 by phone.

#### C. County health department investigation responsibilities

1. Begin routine investigation within one working day.
2. Make sure the patient is appropriately treated and recommend measures for preventing further spread from the patient.
3. Identify and evaluate contacts; educate and recommend measures to prevent further spread from potentially infected contacts.
4. Facilitate appropriate laboratory testing to assist with the diagnosis.
5. Report all confirmed and probable cases (See **Section 3C**) in Merlin.
  - a. An extended data screen is available in Merlin to report additional clinical data. Remember to ask and enter the vaccination history for all patients
  - b. The pertussis case report form is available at:

[http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/\\_documents/crf-pertussis.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/_documents/crf-pertussis.pdf)

### 2. THE DISEASE AND ITS EPIDEMIOLOGY

#### A. Etiologic agent:

*Bordetella pertussis* is a fastidious pleomorphic gram-negative bacillus bacterium.

## B. Description of illness

Classic pertussis, or whooping cough, is characterized by spasms of severe coughing (paroxysms) lasting from six to ten weeks. Pertussis should be suspected when any cough is paroxysmal or lasts more than a week. Pertussis typically lacks fever and classically progresses through three stages:

1. Catarrhal (one to two weeks): mild symptoms of upper respiratory tract inflammation gradually develop with coryza and an intermittent non-productive cough.
2. Paroxysmal (four weeks or longer): spasms of cough, that occur without taking a breath, that may end with a gasp, whoop, or vomiting (post-tussive emesis). Adolescents and adults may have less dramatic symptoms.
3. Convalescent (two to six weeks or longer): gradual resolution of the paroxysmal coughing.

Pertussis can occur at any age, regardless of vaccination history. Apnea, rather than cough, may be the initial or most important symptom in infants less than six months of age. In **infants only**, a clue to the diagnosis is an elevated white blood count (over 15,000/mm<sup>3</sup>) with a predominance of lymphocytes. Pertussis among older children, adults, and those previously immunized can be milder than classic whooping cough; the symptoms may be no more distinctive than other upper respiratory tract infections. This is an important to consider when investigating case contacts.

Death and serious complications occur mainly in infants and can include apnea, malnutrition, pneumonia, pulmonary hypertension, seizures and encephalopathy. Older individuals may suffer from sleep deprivation, sweating, syncope, rib fractures, hernia and urinary incontinence.

The differential diagnosis of pertussis includes other respiratory pathogens such as adenoviruses, *Bordetella parapertussis*, *Mycoplasma pneumoniae*, *Chlamydophila* (formerly *Chlamydia*) *pneumoniae* and respiratory syncytial virus.

During a pertussis investigation, high-risk persons include those at highest risk of severe infections (e.g., infants and persons with an immunodeficiency or severe lung disease), as well as persons that are likely to expose these persons (i.e., pregnant women in the last trimester, family members, healthcare providers, infant caregivers).

\*A brief note about *B. parapertussis*, a less common, non-reportable disease requiring no public health action: Parapertussis has similar but milder symptoms than pertussis and serious complications are rare. Parapertussis can be distinguished from pertussis by culture or polymerase chain reaction (PCR). Unfortunately, infection with *B. pertussis* provides little cross-protection against subsequent infection with the *B. parapertussis* and vice versa; pertussis vaccine does not prevent parapertussis. However, antibiotic treatment and prevention messages for parapertussis are the same as those for pertussis.

### C. Reservoirs

Humans are the only reservoir.

### D. Modes of transmission

*B. pertussis* is transmitted person to person through direct contact with respiratory secretions or via droplets produced from talking or coughing. The precise duration and intensity of exposure needed to cause infection is unclear; an hour or more in a confined space with a contagious individual is generally felt to be a significant exposure. Secondary attack rates are 25–60% among household contacts in the developed world and can reach 80% among fully susceptible persons (i.e., neither immunized nor previously infected).

### E. Incubation period

Typical incubation period is 7–10 days (range 5–21 days).

### F. Period of communicability

Pertussis is highly contagious. Persons with pertussis are most infectious during the catarrhal period and the first two weeks after cough onset. Communicability then decreases, but may continue for three or more weeks after the paroxysmal cough onset. **Therefore, cases are contagious from symptom onset through 21 days after the start of cough, or until completion of five days of appropriate antibiotic therapy.** Some individuals, especially infants, may remain culture-positive for several weeks. Although there is some evidence that asymptomatic infections do occur, there is no evidence that they contribute significantly to disease transmission. Long-term carriage is not believed to occur. Transient nasopharyngeal carriage in immunized children may occur.

### G. Treatment

Early treatment of pertussis cases (within first two weeks of paroxysmal cough) is essential in preventing secondary transmission. Initiating treatment more than three weeks after onset of paroxysmal cough is unlikely to be beneficial and should be limited to situations in which there is on-going contact with high-risk individuals.

#### **Antibiotics used for treatment and prevention**

The antibiotics and dosages used for treatment and post-exposure disease prevention (often referred to as “chemoprophylaxis”) are the same (see Table 1 below). Antibiotics given early in the catarrhal stage may attenuate the disease; when given during the paroxysmal stage communicability is reduced but there is little effect on the course or duration of illness. Azithromycin, clarithromycin, erythromycin and trimethoprim-sulfamethoxazole decrease levels of *B. pertussis* DNA from the nasopharynx, thus decreasing infectivity five days after starting treatment with any of these agents. In principle, chemoprophylaxis of asymptomatic contacts helps to interrupt transmission by eliminating the organism during the incubation period. Azithromycin and erythromycin are both pregnancy category B (minimal risk);

clarithromycin and trimethoprim-sulfamethoxazole are category C and should be used in consultation with a prenatal care provider.

### 1. Azithromycin (Zithromax®)

Azithromycin is as effective as a 14-day course of erythromycin; however, greater convenience and tolerability accompany a higher price. The most frequently reported side effects are gastrointestinal; drug interactions are uncommon but always inquire about other concurrent medications.

*Note:* Because of the very long half-life of azithromycin, recently released one and three-day courses (with the same total dose of 30mg/kg for kids or 1.5 gram for adults) may be as effective as the five-day course; however, they have not yet been studied for pertussis and are not currently recommended for this disease.

### 2. Clarithromycin (Biaxin®)

A seven-day course of clarithromycin is as effective as a 14-day course of erythromycin; again, greater convenience and tolerability come at a higher price. Although uncommon, the most frequently reported side effects are gastrointestinal; drug interactions occur, so inquire about concurrent medications.

### 3. Erythromycin (many brands and generic)

Erythromycin, especially the estolate preparation, has long been the recommended drug for pertussis treatment and prophylaxis. Patient compliance with the cumbersome four-times-daily, 14-day course is poor and gastrointestinal side effects are common. Although the Centers for Disease Control and Prevention (CDC) still recommends a 14-day course of erythromycin (see Table 1), one study has shown that a seven-day course may be equally effective (Halperin SA, et al. *Seven days of erythromycin estolate is as effective as 14 days for treatment of Bordetella pertussis infections.* Pediatrics. 1997;100(1):65–71).

Use of erythromycin in infants can be complicated by infantile hypertrophic pyloric stenosis (IHPS); when prescribing erythromycin to infants less than three months of age, providers should inform parents about the possible risks for IHPS and counsel them about signs of developing IHPS. Overall, serious side effects are rare with erythromycin **unless** the patient is taking other medications; be sure to ask and consult with a pharmacist if there is any concern about interactions.

### 4. Trimethoprim-Sulfamethoxazole, TMP-SMX (Bactrim®, Septra®, generic)

TMP-SMX also appears to be effective in eradicating *B. pertussis* from the nasopharynx; it is recommended as an alternative antibiotic for patients who cannot tolerate any of the above macrolides. This drug can cause nausea, vomiting and rash. TMP-SMX is contraindicated for infants aged <2 months (risk for kernicterus).

**Table 1: Recommended Antimicrobial Treatment and Post Exposure Prophylaxis For Pertussis, By Age Group**

Age group	Primary agents			Alternate agent*
	Azithromycin	Erythromycin	Clarithromycin	TMP-SMZ
<1 month	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available.)	Not preferred. Erythromycin is associated with infantile hypertrophic pyloric stenosis. Use if azithromycin is unavailable; 40–50 mg/kg per day in 4 divided doses for 14 days	Not recommended (safety data unavailable)	Contraindicated for infants aged <2 months (risk for kernicterus)
1–5 months	10 mg/kg per day in a single dose for 5 days	40–50 mg/kg per day in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses for 7 days	Contraindicated at age <2 months. For infants aged ≥2 months, TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged ≥6 months) and children	10 mg/kg in a single dose on day 1 then 5 mg/kg per day (maximum: 500 mg) on days 2–5	40–50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses (maximum: 1 g per day) for 7 days	TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Adults	500 mg in a single dose on day 1 then 250 mg per day on days 2–5	2 g per day in 4 divided doses for 14 days	1 g per day in 2 divided doses for 7 days	TMP 320 mg per day, SMZ 1,600 mg per day in 2 divided doses for 14 days

\* Trimethoprim sulfamethoxazole (TMP–SMZ) can be used as an alternative agent to macrolides in patients aged ≥2 months who are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *Bordetella pertussis*.

Source: *MMWR* 2005; 54: RR–14

**H. Immunity**

The duration of immunity after natural infection with *B. pertussis* is believed to last several years, but laboratory confirmed second infections have been reported and immunity likely wanes over time. Efficacy of the “whole-cell” vaccine was 70–90%, but after five to ten years, protection waned. The acellular vaccine series (recommended in the United States for the entire series since 1996) has an efficacy of approximately 80% in young children but immunity appears to wane quicker, after three to five years. The effectiveness and duration of immunity of acellular pertussis vaccine is currently the subject of much research due to persistent increases in the incidence rate in the United States.

**I. Pertussis in Florida**

Florida Department of Health (DOH) currently receives between 300 and 500 case reports of pertussis per year with an average of 428 cases over the previous four years (2009-2012).

**3. CASE DEFINITIONS**

**A. Clinical case definition**

1. Acute cough illness of any duration
2. Cough illness lasting ≥ 2 weeks
3. **One** of the following signs and symptoms:

- Paroxysms of coughing
- Inspiratory "whoop"
- Posttussive vomiting
- Apnea (with or without cyanosis)(FOR INFANTS AGED <1 YEAR ONLY).

**B. Laboratory criteria for diagnosis**

1. Isolation of *Bordetella pertussis* by culture from clinical specimen  
**OR**
2. Positive polymerase chain reaction (PCR) for *B. pertussis*

**C. Exposure**

1. Epidemiologically-linked to a confirmed case  
**OR**
2. Epidemiologically-linked to a PCR-confirmed probable infant case

**D. Case classification**Confirmed:

- Acute cough illness of any duration (A1) with isolation of *B. pertussis* by culture from a clinical specimen (B1),  
**OR**
- Cough illness lasting  $\geq 2$  weeks (A2) with one at least other symptom (A3) and positive PCR for *B. pertussis* (B2),  
**OR**
- Cough illness lasting  $\geq 2$  weeks (A2) with one at least other symptom (A3) that is epidemiologically-linked to a confirmed case (C1).

Probable:

- Cough illness lasting  $\geq 2$  weeks (A2) with at least one other symptom (A3),  
**OR**
- FOR INFANTS AGED < 1 YEAR ONLY: Acute cough illness of any duration (A1) with at least one other symptom (A3) and positive PCR for *B. pertussis* (B2),  
**OR**
- FOR INFANTS AGED < 1 YEAR ONLY: Acute cough illness of any duration (A1) with at least one other symptom (A3) that is epidemiologically-linked to a confirmed case (C1) or PCR-confirmed probable infant case (C2),  
**OR**
- Cough illness lasting  $\geq 2$  weeks (A2) with at least one other symptom (A3) that is epidemiologically-linked ONLY to a PCR-confirmed probable infant case (C2).

**E. Comment**

The clinical case definition above is appropriate for endemic or sporadic cases. In outbreak settings, a case may be defined as a cough illness lasting at least 2 weeks (as reported by a health professional). Because direct fluorescent antibody testing of nasopharyngeal secretions has been demonstrated in some studies to have low sensitivity and variable specificity<sup>1,2</sup>, such testing should not be relied on as a

criterion for laboratory confirmation. Serologic testing (IgM and IgG) for pertussis is available in some areas but is not standardized and, therefore, should not be relied on as a criterion for laboratory confirmation.

## References

1. Broome CV, Fraser DW, English WJ. Pertussis--diagnostic methods and surveillance. In: Manclark CR, Hill JC, eds. International Symposium on Pertussis. Bethesda, MD: US Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1979; DHEW publication no. (NIH)79-1830:19-22.
2. Halperin SA, Bortolussi R, Wort AJ. Evaluation of culture, immunofluorescence, and serology for the diagnosis of pertussis. *J Clin Microbiol* 1989;27:752-7.

*Questions about pertussis follow-up should be directed to the Department of Health Immunization Program at (850) 245-4342.*

## 4. LABORATORY TESTING

### A. Criteria for Diagnosis

**Isolation of *B. pertussis* by culture and detection of *B. pertussis* by PCR are the only ways to confirm the diagnosis of pertussis.**

1. **Nasopharyngeal Culture:** Culture is the most specific test for pertussis. Culture from the posterior nasopharynx is most sensitive in the first two weeks of illness and is more sensitive in young children than in adolescents and adults. However, positive nasopharyngeal cultures have occasionally been obtained from untreated adults up to six weeks after the onset of any symptoms. Because *B. pertussis* is fastidious and its isolation in culture is easily obscured by the growth of other nasopharyngeal organisms, proper specimen collection and subsequent handling of the specimen will improve the rate of recovery. Specimens collected after the initiation of any type of antibiotic therapy are less likely to yield *B. pertussis* isolation. Since so many factors can affect the sensitivity of culture for *B. pertussis*, a negative culture result should not be considered evidence that pertussis has been ruled-out. Throat and anterior nares swabs have unacceptably low rates of recovery of *B. pertussis* and should not be used.
2. **Polymerase Chain Reaction (PCR):** PCR testing for *B. pertussis* should be used in addition to culture. It is more sensitive than culture and results are available more quickly. Published data suggest that PCR may detect *B. pertussis* when culture is negative. It is necessary to use Copan or Dacron swabs. Calcium alginate swabs or wood handles can render the specimen unsatisfactory for PCR testing. A negative PCR result on an exposed symptomatic high-risk person such as a health care worker should not be considered evidence that pertussis has been ruled out.
3. **Direct Fluorescent Antibody (DFA) Testing:** A DFA test was used for screening in the past but lacks sensitivity and specificity for *B. pertussis*. Use of this test is

- discouraged. No public health action is warranted by reports of positive DFA tests for pertussis.
4. Serologies: Although serology may have a role in the future, the lack of standardization of these antibody tests and their unknown correlation with pertussis illness limits their current usefulness. Positive pertussis serology results should trigger a review of medical records to determine if the person meets clinical case definition. Such cases can be reported as probable. If outbreaks are detected by investigating an individual with positive serologic results, it is important to coordinate culture and PCR testing from a person with a recent onset of illness, preferably, before they are treated with antibiotics.
  5. Susceptibility Testing: Routine susceptibility testing of *B. pertussis* isolates is not recommended since resistance to macrolide antibiotics is rare. Consult with the Bureau of Epidemiology (DCBE) if a patient has a positive *B. pertussis* culture after completion of an appropriate course of antimicrobial therapy and patient compliance with therapy has been verified.

#### **B. Services available at the Florida Bureau of Public Health Laboratories (BPHL)**

BPHL–Jacksonville can perform microbiologic cultures and PCR for pertussis on posterior nasopharyngeal specimens. BPHL–Jacksonville can also confirm that pure isolates submitted from other laboratories are *B. pertussis*. All submissions should be accompanied by a Clinical Laboratory Submission Form:

[http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/\\_documents/dh1847clinicallabssubmissionform.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/dh1847clinicallabssubmissionform.pdf)

1. Packaging and shipping:  
[http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/\\_documents/packagingflowchar0422051.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/packagingflowchar0422051.pdf)
2. Contact BPHL-Jacksonville with questions:  
(904) 791-1500

#### **C. Specimen collection**

Obtain a posterior nasopharyngeal specimen as early as possible in the illness (during the first three weeks is optimum), preferably, prior to administration of antibiotics. Instructions for proper specimen collection are included in **Appendix A**. Collection and transport procedures must be followed as closely as possible for the best results.

## **5. ROUTINE CASE INVESTIGATION**

Interview the patient and others who might be able to provide pertinent information.

#### **A. Evaluate the diagnosis**

Review the clinical presentation and laboratory test results. Conduct a public health investigation for the following:

1. All confirmed and probable cases (see **Section 3C**).
2. Persons with a cough illness lasting at least two weeks in an outbreak setting.
3. Persons with a positive PCR for *B. pertussis* and a compatible illness whose duration of cough has been less than 14 days at the time of reporting.
4. Persons with an epidemiologic link to a confirmed case and a compatible illness whose duration of cough has been less than 14 days at the time of reporting.
5. Other high-risk persons with symptoms highly suspicious of pertussis who do not meet the probable or confirmed case definitions.

Note: For persons described in numbers two and three above, follow-up on or after the fourteenth day after cough onset to establish duration of cough and criteria for clinical case definition.

## **B. Identify potential sources of infection**

During the initial interview, ask about close contacts that had a cough illness during the one to three week interval prior to the current patient's onset. Because mild or atypical illnesses are common, it is not always possible to identify the actual source of infection. If a potential source patient is identified, investigate this person as a possible case.

## **C. Identify potentially exposed persons**

### **1. Identify close contacts**

Identification of close contacts of patients is important for three reasons:

- High-risk asymptomatic contacts and asymptomatic household contacts need prophylaxis.
- Low-risk asymptomatic contacts outside of the household need to be educated about seeking medical care and using respiratory etiquette if symptoms develop. These contacts can also be referred to their health care providers to discuss post-exposure prophylaxis.
- Symptomatic contacts may need testing, treatment or both.

A close contact is defined as direct contact with respiratory, oral or nasal secretions from a symptomatic case-patient, direct face-to-face contact with a case-patient who is symptomatic, regardless of duration; or shared confined space in close proximity (within three feet) for a prolonged period of time (over one hour) with a symptomatic case-patient.

Due to common delays in diagnosis and reporting pertussis, it is possible that

infected close contacts will have experienced the onset of disease by the time a contact investigation is initiated.

Close contacts are identified through routine communicable disease interview of patient or proxy. The top priority is finding exposed high-risk contacts (e.g., children under one year of age, pregnant women, immunocompromised persons and health care workers), in order to provide prophylaxis promptly. If groups such as a class or a sports team are identified as close contacts, it may be helpful to obtain the names and phone numbers of teachers, principals or coaches.

**2. Identify settings where the patient spent time while communicable and where transmission to high-risk contacts may have occurred**

These settings include schools, childcare settings, workplaces, health care facilities and other organizations. See **Managing Special Situations** below.

**3. Prioritize follow-up of contacts with respiratory symptoms**

Symptomatic contacts of confirmed pertussis patients may meet the confirmed case definition at the time of initial interview and are thus reportable; like other cases, they should be interviewed. Other symptomatic contacts of confirmed cases may not meet the confirmed case definition at the time of interview; determine in consultation with DCBE whether to act on these as if they were cases. For example, investigation of a smoker with a chronic cough that is unchanged since pertussis exposure is less urgent than inquiring after a daycare employee with a cough of seven days duration.

**D. Environmental evaluation:** None

**E. Merlin data entry**

Create a case in Merlin under disease code **PERTUSSIS– 03390**. Enter the data collected into Merlin, being sure to include all required fields on the Basic Data screen, complete the Case Symptoms screen, and attach all relevant labs. Please enter and attach **ALL** labs received to the case and complete the extended data screens.

## **6. CONTROLLING FURTHER SPREAD**

**A. Case management**

**Treating cases:** Make sure that the patient is being appropriately treated with antibiotics (see **Section 2G** above). If a patient has not had a medical evaluation, then they should be referred to a clinician for assessment, laboratory testing, and consideration of treatment. The clinician should be made aware of the reasons for referral.

**B. Infection control recommendations**

1. Hospitalized patients should be cared for using droplet precautions; health care workers in out-patient settings should wear surgical masks and eye protection when evaluating proven or suspected pertussis patients. Droplet precautions should be maintained until five days after the patient is placed on effective therapy.
2. Work, school and child care restrictions: All patients and symptomatic contacts should be excluded from child care, school, and health care settings until five days of therapy with an appropriate antibiotic have been completed, returning on day six. Treated persons can be considered no longer contagious after five days of antibiotics even if they continue to cough and/or if the course of antibiotic treatment is not yet completed. Patients who do not take appropriate antimicrobial treatment should be excluded from child care, school, and health care settings for 21 days from onset of cough.
3. All patients and symptomatic contacts should also be taught “respiratory etiquette” and encouraged to avoid contact with other persons at social activities, especially settings which might include high-risk persons.

## C. Contact management

### 1. Symptomatic contacts

If a symptomatic close contact has not had a medical evaluation, then they should be referred to a clinician for assessment, laboratory testing and consideration of treatment. The clinician should be made aware of the reasons for referral. If pertussis is suspected, the symptomatic contact should be excluded according to the same guidelines used for confirmed cases.

### 2. Chemoprophylaxis (asymptomatic contacts)

Most pertussis in adults and adolescents is neither diagnosed nor reported and antibiotic prophylaxis does not control the transmission of pertussis when it is widespread in the community. The effort to provide antibiotic prophylaxis for pertussis must focus on household contacts and high-risk close contacts of pertussis cases. All household members and high-risk asymptomatic close contacts of pertussis cases should receive antibiotic prophylaxis either from their health care provider or from the CHD **regardless of immunization status**. Other asymptomatic close contacts can discuss the need for prophylaxis with their health care provider. Contacts with underlying immunodeficiency or lung disease should contact their health care provider promptly.

Health care workers that have direct contact with a person with pertussis, that are not wearing appropriate personal protection equipment (PPE), should receive antibiotic prophylaxis, regardless of vaccination status.

Initiating prophylaxis more than three weeks after exposure has limited benefit and is not recommended, with the exception of high-risk contacts for which prophylaxis may be considered for up to six weeks after exposure.

### 3. Active immunization

Exposed children less than seven years of age lacking documentation of completion of the four-dose primary DTaP series should be vaccinated to complete the series using the minimal intervals. Children between the ages of 4-6 years who have not received a second booster dose of DTaP (usually the fifth dose) should be vaccinated unless the last dose in the series was given on or after the child's fourth birthday. Children aged seven and older who have not received Tdap should get it at this time. Those who received a Td booster should receive Tdap regardless of the interval since the last Td. Adults who have not previously received a Tdap booster should be encouraged to receive the vaccine especially if they have or plan on having contact with infant(s) less than 12 months of age.

*Note:* Post-exposure vaccination is not recommended as post-exposure prophylaxis, or in place of chemoprophylaxis if indicated, but rather to prevent future infections.

### 4. Education

Advise close contacts of pertussis patients of the risk of infection; counsel them to watch for signs or symptoms of pertussis occurring within 21 days after the last exposure. The method for communicating with contacts will depend on the situation; schools, child care settings and organized groups can often be efficiently contacted by letter or handout in collaboration with the respective administrators or leaders. If symptoms are present or develop in these contacts, they need to understand that respiratory etiquette (see **Section 8B**) should be followed and medical care should be sought promptly. Remember, providers must be made aware of the pertussis exposure in order to appropriately evaluate and treat the contact, and in order to limit risk to others in the office. During outbreaks and periods of increased community pertussis activity, local health care providers should be updated on the current situation and reminded about the signs and symptoms of pertussis, diagnostic testing options, prophylaxis or treatment recommendations and infection control for the office by the CHD.

**D. Environmental measures:** None

## 7. MANAGING SENSITIVE SITUATIONS

### A. Case works at or attends school or daycare (probable or confirmed case)

#### 1. Notification and case finding

- a. Notify parents of children in the same classroom(s) as soon as possible but within 72 hours. Quicker notification is appropriate in settings with children under age one year. In addition to providing background information on pertussis and details regarding the exposure circumstances (e.g., date, time, setting), the notice should advise the parents to:
  - I. Verify their child's pertussis immunizations and get remaining doses in

- the series if necessary;
  - II. Report any respiratory illness that occurs within three weeks of last contact with the patient and seek medical care for diagnosis and appropriate treatment;
  - III. Obtain chemoprophylaxis for their child, if indicated.
- b. Ask about pertussis-like illnesses (active case surveillance) among attendees or employees within the previous four weeks. In settings involving children less than one year, all potential patients should be investigated and necessary measures taken to stop further transmission.

## **2. Preventing further spread**

- a. Assess the immunization status of all students and refer for immunization as needed.
- b. Recommend prophylaxis as indicated.
- c. Refer symptomatic students, teachers, volunteers and other staff to their health care providers for treatment and nasopharyngeal specimen collection.
- d. Daycare operators should notify their CHD of any additional respiratory illness occurring during the period of surveillance. The advisability of new admissions to the facility should be evaluated according to level of risk for pertussis complications.

## **3. Exclusion from daycare or school (probable or confirmed case)**

- a. All confirmed and probable cases should be excluded from child care or school until the sixth day after starting appropriate antimicrobial treatment (that is until five days of antibiotic treatment are completed).
- b. Confirmed and probable cases (along with PCR-positive persons and persons with pertussis-like symptoms who may not yet meet case definition) who do not take appropriate antimicrobial treatment should be excluded from childcare or school for 21 days from onset of cough. If cough ceases in less than 21 days without treatment, readmission can be discussed with the CHD.
- c. In settings where children less than one year have been exposed, the CHD may also consider excluding asymptomatic contacts who elect not to take antibiotics or persons who are not up-to-date with pertussis immunization (especially children who have not had the initial three dose series of a pertussis-containing vaccine) for 21 days after their last date of exposure.

## **B. Case is a health care worker**

The infection control practitioner (ICP) of the affected facility should identify and refer all symptomatic close contacts (patients and coworkers) for medical evaluation and presumptive treatment immediately. In addition, prophylaxis should be given to all asymptomatic health care workers with close contact, regardless of vaccination status, because of the risk they would pose to other patients should they develop pertussis. Asymptomatic health care workers who have appropriately followed standard and droplet precautions (including wearing a surgical mask) during close contact with an infected patient do not require prophylaxis. Contacts may remain in the workplace if they comply with prophylaxis and lack respiratory symptoms; they

should be under surveillance for 21 days after their last known exposure. Health care workers should contact the facility ICP if respiratory symptoms develop and stay away from the workplace until five days of antibiotic therapy have been completed, unless pertussis can be excluded as a cause of their symptoms (see **Section 4A 1 and 2**). If the facility has no ICP, the CHD can consult with DCBE for guidance. Health care workers with direct patient contact should receive (or have already received at the age of 7 years or older) a dose of Tdap unless contraindicated.

### C. Outbreak situations

Pertussis outbreaks are defined as two or more cases clustered in time (e.g., cases that occur within 42 days of each other) and space (e.g., in a particular child care center or classroom). The outbreak case definition may be used to count cases if one case has been laboratory confirmed by either culture or PCR. In outbreak settings, including households, a case may be defined as a person with a cough illness lasting two weeks or longer. A confirmed case in an outbreak setting is one that meets clinical case definition and is epidemiologically linked directly to a case confirmed by either culture or PCR (i.e., a first generation contact). Outbreaks are more likely in certain settings (e.g., schools with a large proportion of unimmunized children or daycare centers with many infants who have not completed a primary DTaP series). Outbreaks also occur in older students whose immunity to pertussis has waned after immunization.

If there are multiple cases of pertussis in a child care or school setting, work with the administration to facilitate distribution of an appropriate letter to inform parents/guardians and staff about pertussis; local health care providers should also be alerted. Letters can be distributed to classes, grades, extracurricular groups or to the entire child care center or school depending on the situation. School-wide or community-wide notification through a media alert is best done by consensus with school officials and CHD staff. Exclusion of symptom free un-immunized students is not generally recommended during pertussis outbreaks in schools. If exclusion of unvaccinated children is being considered in response to a pertussis outbreak, consultation with the DCBE and Immunization Section is suggested. During an outbreak, laboratory testing of each symptomatic contact may not be necessary or feasible. Consider limiting testing of symptomatic persons in this situation to those who are high-risk. Classroom-wide prophylaxis is generally not recommended except in high-risk settings such as child care settings where infants less than one year of age are cared for. In rare situations, the Immunization Section, in conjunction with DCBE, may recommend an accelerated DTaP schedule for infants in an attempt to provide earlier immunity for this high-risk group.

For more information on outbreak management, see:  
<http://www.cdc.gov/vaccines/pubs/pertussis-guide/guide.htm>

## 8. ROUTINE PREVENTION

### A. Immunization recommendations

Immunization with acellular pertussis vaccines in combination with diphtheria and tetanus toxoids as DTaP is recommended for all children younger than seven years

of age according to the following schedule:

**Routine DTaP Vaccination Schedule**

Dose	Age	Minimal Interval
1	2 months	-
2	4 months	4 weeks
3	6 months	4 weeks
4	15-18 months	6 months
5 (Booster) *	4-6 years	-

\* If the fourth dose is received on or after the fourth birthday, a fifth dose is not required.

For additional information regarding use of the DTaP vaccine during childhood, adverse reactions and contraindications see the most recent *Red Book* or *Epidemiology and Prevention of Vaccine-Preventable Diseases* (Pink Book).

Two tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) products are licensed in the United States for use in adolescents and adults. BOOSTRIX® is licensed for use in persons aged ten years and older and ADACEL™ is licensed for use in persons aged 11–64 years. The Advisory Committee on Immunization Practices (ACIP) currently recommends that:

1. Adolescents aged 11–18 years, who have completed the recommended childhood diphtheria and tetanus toxoids and pertussis/diphtheria and tetanus toxoids and acellular pertussis vaccine (DTP/DTaP) vaccination series, and adults aged 19–64 years should receive a single dose of Tdap instead of tetanus and diphtheria toxoids vaccine (Td) for booster immunization against tetanus, diphtheria, and pertussis. The preferred age for adolescent Tdap vaccination is 11–12 years.
2. Children aged 7–10 years not fully vaccinated or unvaccinated against pertussis with no known contraindication should receive a single dose of Tdap. Those with unknown vaccination history or no vaccination against tetanus, diphtheria, or pertussis should receive a series of three vaccinations containing tetanus and diphtheria toxoids. Tdap is preferred as the first dose in the three dose catch-up series.
3. Adolescents aged 11–18 years who received Td, but not Tdap, are encouraged to receive a single dose of Tdap to provide protection against pertussis regardless of the interval since the last Td.
4. For pregnant women, the ACIP recommends that women's health care personnel implement a Tdap vaccination program for pregnant women who previously have not received Tdap. Health care personnel should administer Tdap during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation). If not administered during pregnancy, Tdap should be administered immediately postpartum.
5. All adults who have not previously received a dose of Tdap should receive a single dose of Tdap in place of Td for booster immunization with emphasis on those in close contact or who anticipate contact with an infant aged <12 months.
6. Health care personnel in hospitals and ambulatory care settings with direct patient contact who have not previously received Tdap should receive a dose of

Tdap.

7. Tdap may be administered regardless of the interval since the last Td.

For additional information regarding the use of Tdap, see the ACIP recommendations available at:  
<http://www.cdc.gov/vaccines/pubs/ACIP-list.htm#tdap>.

## B. Prevention recommendations

In addition to immunization, persons should practice “respiratory etiquette” or good health manners to stop the spread of respiratory pathogens.

### Persons can keep respiratory pathogens to themselves by:

- Covering the nose and mouth with a tissue when sneezing, coughing or blowing their nose.
- Throwing out used tissues in the trash as soon as possible.
- Always washing hands after sneezing, blowing the nose, coughing or after touching used tissues or handkerchiefs.
- Washing hands often when sick.
- Using warm water and soap or alcohol-based hand sanitizers to wash hands.
- Staying home if coughing and febrile.
- Seeing a doctor as soon as possible if coughing and febrile, and following their instructions, including taking medicine as prescribed and getting lots of rest.
- If requested, using facemasks provided in doctors’ offices or clinic waiting rooms.

### Persons can keep pathogens away by:

- Washing hands before eating, or touching eyes, nose or mouth.
- Washing hands after touching anyone else who is sneezing, coughing, blowing their nose, or whose nose is running.
- Not sharing items like cigarettes, towels, lipstick, toys, or anything else that might be contaminated with respiratory germs.
- Not sharing food, utensils or beverage containers with others.

## 9. REFERENCES

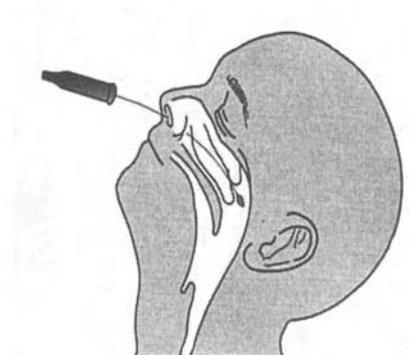
- A. Heymann, D.L. (Ed.). (2008). *Control of Communicable Diseases Manual* (19<sup>th</sup> ed.). Washington: American Public Health Association.
- B. American Academy of Pediatrics. (2012). *Red Book: 2012 Report of the Committee on Infectious Diseases* (29<sup>th</sup> ed.). Grove Village, IL: American Academy of Pediatrics.

**Appendix A: Specimen Collection Procedures**

1. If needed, request *Bordetella pertussis* collection supplies from BPHL-Jacksonville by faxing your request to 904-791-1637 Attn: Supply, or by calling the General Bacteriology laboratory at 904-791-1605. Supplies will include Copan polyester swabs, Regan-Lowe transport media, a sterile transport sleeve, and shipping materials.
2. Collect posterior nasopharyngeal specimens as soon as possible after symptoms develop. Specimens may be collected up to four weeks after onset as long as antibiotics have not been started.

*Note: Throat specimens, nares swabs, and sputum samples are unacceptable specimens and will not be processed.*

3. Use a Copan or Dacron swab to collect a nasopharyngeal specimen. Do not use wooden shafted swabs or Calcium alginate swabs (contraindicated for PCR testing). Health care providers may consider piggybacking two swabs if a specimen is need for both culture and PCR.
  - a. Bend wire(s) so that it mimics the curve of the nasal airway.
  - b. Gently pass swab(s) through the nostril to the posterior nasopharynx. **DO NOT** force the swab(s). A slight resistance will be felt when the posterior nasopharynx is reached.
  - c. Rotate the swab(s) and ideally leave in place for 10 seconds or until the patient coughs.



4. Specimen handling:
  - a. If the specimen will arrive at BPHL within 24 hours (preferred):
    - 1) Collect using Copan nasopharyngeal swab, replace swab in the sleeve provided
    - 2) Ship cooler overnight using ice packs.
  - b. If specimen cannot be sent to the state laboratory within 24 hours:
    - 1) Collect using nasopharyngeal swab (Dacron or Copan)
    - 2) Ship in Regan-Lowe transport media using ice packs. This should arrive in Jacksonville within 2–3 days.
5. Label the tubes with the client's name and complete all sections of Clinical Laboratory Submission Form available at:  
[http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/\\_documents/dh1847clinicallabsubmissionform.pdf](http://www.floridahealth.gov/diseases-and-conditions/disease-reporting-and-management/disease-reporting-and-surveillance/surveillance-and-investigation-guidance/_documents/dh1847clinicallabsubmissionform.pdf)
6. Please contact the General Bacteriology laboratory at BPHL-Jacksonville for handling and transport issues not specifically addressed in these guidelines.

## Appendix B: Definitions

### A. Close contact (of a pertussis case)

Pertussis spreads by direct contact with infectious respiratory secretions by droplet transmission. Such droplets generally travel three feet or less when an infected person talks, coughs, or sneezes. The risk for transmission of pertussis is a function of multiple factors including clinical features of the source case as they relate to communicability (e.g., stage of illness, character of cough), proximity and duration of contact, ventilation, and use of appropriate infection control measures (mask, eye protection). Consult with an Immunization Section nurse or a DCBE epidemiologist as needed on a case-by-case basis regarding determinations of close contacts.

Examples of close contact include:

1. Direct face-to-face contact with a symptomatic case-patient during the contagious period. This includes household and immediate family members, intimate partners, and childcare contacts (those who spend many hours together or sleep under the same roof).
2. An obvious exposure that involves direct contact with respiratory, oral or nasal secretions from a case-patient during the contagious period (e.g., a cough or sneeze in the face, sharing eating utensils, sharing water bottles, kissing, mouth-to-mouth resuscitation, performing intubation or nasotracheal suctioning without a mask).
3. Close proximity for a prolonged period of time with a case-patient during the contagious period. Risk of droplet exposure increases with longer duration and closer proximity of contact.

Examples of persons who may be at increased risk include:

- Non-household close friends or other social contacts
- Some passengers during shared transportation
- Some contacts at community activities or at the place of employment
- Some health care workers caring for a case without wearing a mask
- Children attending an after-school care group or play group on the same days.

Note: Close contact does not include activities such as walking by a person or briefly sitting across a waiting room or office.

### B. High-risk cases and contacts

High-risk persons include persons at increased risk for severe pertussis and persons who may transmit pertussis to persons at high risk for severe pertussis. High-risk groups are:

1. Children under one year of age: Increased risk for severe disease
2. Pregnant women, particularly those in the last three weeks of pregnancy: Potential for transmission to the newborn, other pregnant women (e.g., in obstetrical offices or prenatal classes) and to health care workers

3. Health care worker with face-to-face patient contact: Potential for transmission to persons (patients) at increased risk for severe disease
4. Close contacts of a pertussis case who have an increased likelihood of transmitting pertussis to individuals at high-risk for severe disease (e.g., persons working with infants or pregnant women, members of household with infants and pregnant women)