

# **Pertussis**

## **(Whooping Cough)**

**24-Hour Reportable Disease**

### **1) THE DISEASE AND ITS EPIDEMIOLOGY**

#### **A. Etiologic Agent**

Pertussis is caused by the bacterium *Bordetella pertussis*. *B. pertussis* is a fastidious, aerobic, gram-negative coccobacillus (short, thick rod).

#### **B. Clinical Description**

The duration of classic pertussis is 6 to 10 weeks, however, symptoms may last 3 months. The clinical course of illness is divided into three stages:

- **Catarrhal stage** - characterized by the insidious onset of mild upper respiratory tract symptoms, such as, nasal congestion, runny nose, mild sore throat, mild dry cough, and minimal or no fever. The cough gradually becomes more severe and after 1-2 weeks the next stage (paroxysmal stage) develops.
- **Paroxysmal stage** - characterized by coughing fits (paroxysms), which may be followed by a crowing or high-pitched inspiratory whoop, vomiting, and/or apnea. This stage usually lasts 1-6 weeks, but may continue for 10 weeks.
  - Paroxysmal cough is sudden uncontrollable “spasms” or spells of coughing where one cough follows the next without a break for breathing. Paroxysmal episodes occur more frequently at night. The person usually appears relatively well between coughing fits.
  - Whoop is a high-pitched noise heard upon inhalation after a coughing spasm, due to a constricted airway.
  - Apnea is a period of not breathing, which may occur either after a coughing spasm or spontaneously in an infant.
  - Post-tussive vomiting is vomiting that follows a paroxysm of coughing.
- **Convalescent stage** - characterized by gradual recovery with fewer paroxysmal coughing episodes and cough usually disappears in 2-3 weeks, but may continue for months. During the recovery period, super imposed viral respiratory infections can trigger a reoccurrence of paroxysms.

Paroxysms may recur with subsequent respiratory infections for many months after recovering from pertussis.

The clinical presentation of pertussis is variable and its diagnosis challenging. Physicians should include pertussis in their differential diagnosis for patients in all age groups who present with a prolonged cough illness. Infants less than 6 months of age, vaccinated children, adolescents, and adults may not have the typical whoop or cough paroxysms. Apnea is a common manifestation of infants less than 6 months of age and may occur in the absence of a cough in this age group. Pertussis is most severe when it occurs during the first 6 months of life (particularly for preterm infants). Complications include pneumonia, seizures, encephalopathy, and death. The differential

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diagnosis for pertussis includes infections due to parapertussis, mycoplasma, chlamydia, respiratory syncytial virus (RSV), and adenovirus.

### **C. Reservoirs**

Humans are the only known host. Adolescents and adults are an important reservoir for *B. pertussis* and are often the source of infection for infants.

### **D. Modes of Transmission**

Pertussis is transmitted person-to-person via the respiratory route. Transmission occurs through large aerosolized respiratory droplets or direct contact with secretions from the respiratory tract of infectious individuals. Typically, exposure to pertussis requires close face-to-face contact (within 3 feet) with the infected person. Pertussis can be spread when an infected person is coughing, sneezing, talking, and another individual breathes in the bacteria or during certain medical procedures. Rarely, transmission may occur by contact with articles freshly contaminated with respiratory secretions of an infected person (the bacteria do not survive long outside the body). A silent carrier state may exist and is probably of little importance in maintaining pertussis organisms in the community. Transmission from asymptomatic infected persons to others is less likely, since asymptomatic persons do not have a cough.

### **E. Incubation Period**

The incubation period is usually 7–10 days (range of 4–21 days), and rarely may be as long as 42 days.

### **F. Period of Communicability or Infectious Period**

- Most infectious during the catarrhal (early) stage.
- Infectious during the first 21 days of cough if not treated with appropriate antibiotic.
- No longer infectious after 5 days of treatment with appropriate antibiotic.
- See Disease Control Measures (Section 6) for appropriate antibiotics.
- Untreated and unvaccinated infants may remain culture-positive for > 6 weeks.

### **G. Epidemiology**

Pertussis occurs worldwide. It is endemic, with peaks occurring every 3–5 years. Pertussis exhibits no distinct seasonality in the United States. It is highly infectious, with secondary attack rates of 80% among susceptible household contacts.

Pertussis is primarily a toxin-mediated disease. The bacteria attach to the respiratory cilia (microscopic hair-like structures), and produce toxins that paralyze the cilia. It causes inflammation of the respiratory tract and respiratory tissue damage, which interferes with clearing of pulmonary secretions.

Widespread immunization with pertussis vaccine since the mid-1940s is primarily responsible for the reduction of pertussis morbidity and mortality in the United States. An annual average incidence rate of approximately 150 cases/100,000 was reported during 1922 -1940, as compared to a rate of 0.5 case/100,000 during 1976 in the United States.

Pertussis remains endemic in the United States despite longstanding routine childhood pertussis vaccination. It is the only disease in the United States for which universal childhood vaccine is recommended that has an increasing trend in reported cases. Pertussis incidence has been increasing since the early 1980s with an incidence rate of 8.5 cases/100,000 reported during 2004 in

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the United States. There has been a large increase in reported adult and adolescent pertussis cases since 1996. Some of the increase is due to improved recognition and diagnosis of pertussis among older age groups by clinicians aware of waning immunity and modified pertussis symptoms. In addition, greater access and use of lab testing, and increased surveillance may have contributed to the increase in reported cases. Some of the reported increase may also represent a real increase in pertussis incidence. Adults and adolescents serve as a source of infection for infants and under-immunized preschool children. In Colorado, the proportion of reported pertussis cases greater than nine years of age has increased from 56% of the cases in 2000 to 76% of the cases in 2005.

Protection after DTP/DTaP vaccination wanes over time, resulting in little or no protection 5 to 10 years following the last dose. Until 2005, there was not a pertussis vaccine licensed for use in persons  $\geq 7$  years of age. In 2005, the FDA licensed two Tdap (tetanus toxoid, diphtheria toxoid, and acellular pertussis) vaccines for use as a single dose booster in adolescents and adults. Neither vaccination nor natural disease confers complete or lifelong protective immunity against pertussis or reinfection.

Colorado pertussis statistics are available on the CDPHE website:

[www.cdphe.state.co.us/dc/CODiseaseStatistics/index.html](http://www.cdphe.state.co.us/dc/CODiseaseStatistics/index.html) or under the Vaccine Preventable Diseases section at [www.cdphe.state.co.us/dc/surveillancereports.html](http://www.cdphe.state.co.us/dc/surveillancereports.html).

## 2) CASE DEFINITION

### **Clinical Description**

A cough illness lasting at least 14 days with **one** of the following: paroxysms of coughing, inspiratory “whoop,” **or** post-tussive vomiting, without other apparent cause (as reported by a health professional).

### **Laboratory Criteria for Diagnosis**

- Isolation of *Bordetella pertussis* from clinical specimen (culture positive), or
- Positive polymerase chain reaction (PCR) for *B. pertussis* DNA. Pertussis may be detected by PCR even if the person has been treated or has been coughing for some time.
- Note: Serological testing for *B. pertussis* is not standardized (except tests run by the Massachusetts State Health Department Laboratory). Direct fluorescent antibody (DFA) testing for *B. pertussis* has low sensitivity (false negative results) and variable specificity (false positive results). For these reasons, serology and DFA results should not be relied on as a criterion for laboratory confirmation of pertussis.

### **Case Classification**

#### Confirmed:

- a. A positive culture for *B. pertussis* and an acute cough illness of any duration, or
- b. Meets the clinical case definition and is confirmed by PCR, or
- c. Meets the clinical definition and is epidemiologically linked (epi-linked) directly to a case confirmed by either culture or PCR.

Probable: Meets the clinical case definition, is not laboratory confirmed, and is not epidemiologically linked to a laboratory-confirmed case; also includes cases meeting the outbreak case definition.

(Note: DFA positive and/or serology positive tests do not meet the criteria for pertussis laboratory confirmation.)

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**Outbreak:** Two or more cases involving two or more households clustered in time (e.g., occurring within 42 days of each other) and either epi-linked or sharing common space (e.g., in one building) where transmission is suspected to have occurred (e.g., a school). One case in an outbreak must be lab confirmed (PCR positive and meets case definition, or culture positive). In an outbreak setting, a case may be defined as an acute cough illness lasting  $\geq 2$  weeks without other symptoms.

**Suspect:** A clinical syndrome compatible with pertussis; an illness consistent with pertussis and without other apparent cause, such as:

- a. cough of  $\geq 7$  days, or
- b. paroxysmal cough of any duration, or
- c. cough with inspiratory whoop, or
- d. cough associated with apnea in an infant, or
- e. cough in a close contact of a confirmed or probable case.

## **High-Risk Cases or High-Risk Contacts**

1. High-risk cases or contacts are persons who are at risk for developing severe disease and adverse outcomes. **Infants < 1 year of age are considered high-risk cases and contacts**. In addition, others that may be at risk, but less data are available, include:
  - Persons who have an immunodeficiency condition
  - Persons who have other underlying severe disease (e.g., chronic lung disease, respiratory insufficiency, and cystic fibrosis)
2. In addition, high-risk cases or contacts include persons having or suspected of having pertussis, or contacts of a pertussis case, who may expose persons at high risk for severe disease. These other high-risk cases or contacts include:
  - Health care workers, including laboratory technicians, radiology technicians, and hospital volunteers, etc.
  - Midwife / Labor coach
  - Babysitter (of infants)
  - Pregnant woman (because of the risk of exposing other pregnant women, health care workers, and newborn infants)
  - Household members or contacts who have pertussis and may expose an infant

## **3) REPORTING CRITERIA**

### **What to Report to the Colorado Department of Public Health and Environment (CDPHE) or local health agency**

- Confirmed and probable pertussis cases.
- Pertussis cases should be reported within **24 hours** of a positive laboratory test or diagnosis (if no test is being performed).
- Cases should be reported using telephone, fax or the Colorado Electronic Disease Reporting System (CEDRS) to CDPHE or local health departments. See below for phone and fax numbers.

### **Purpose of Surveillance and Reporting**

- To identify cases for investigation.
- To identify sources and sites of transmission, and any additional cases.
- To identify exposed persons, assure timely administration of antimicrobial prophylaxis/treatment, and prevent further spread of the disease.

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- To promptly identify clusters and potential outbreaks of disease.
- To monitor trends in disease incidence.
- To monitor vaccine coverage of at risk populations.

## **Important CDPHE Web Resources, Telephone and Fax Numbers**

- CDPHE Communicable Disease Epidemiology Program
  - Phone: 303-692-2700 or 800-866-2759 (voicemail) or 800-886-7689 x2700
  - Fax: 303-782-0338 or 800-811-7263
  - After hours: 303-370-9395
- CDPHE Molecular Science Laboratory (includes Pertussis PCR Lab): 303-692-3286 or -3486 or -3494
- Communicable Disease Manual (CD Manual) website:  
[www.cdphe.state.co.us/dc/epidemiology/dc\\_manual.html](http://www.cdphe.state.co.us/dc/epidemiology/dc_manual.html)
- Pertussis webpage:  
[www.cdphe.state.co.us/dc/Epidemiology/Pertussis/index.html](http://www.cdphe.state.co.us/dc/Epidemiology/Pertussis/index.html)
- [Summary of Pertussis Investigation Control and Guidelines](#) on the pertussis webpage

## **4) STATE LABORATORY SERVICES**

### **Laboratory Testing Services Available**

- CDPHE Molecular Science Laboratory will test nasal wash or nasopharyngeal swab specimens using a polymerase chain reaction (PCR) assay for *B. pertussis* DNA.
- Nasal wash is the preferred specimen.
- CDPHE Lab charges a fee for a PCR testing.
- Testing may be provided free of charge if the specimen has been approved by CDPHE Communicable Disease Program staff as being part of a public health investigation.
- CDPHE [Pertussis Specimen Collection](#) instructions are available on the CD Manual website.

## **5) CASE INVESTIGATION**

**Investigate all pertussis reports including all suspect cases. (See Section 2 – Case Definition for suspect case definition.)** Cases should be investigated to:

- Identify close contacts and high-risk contacts of the case and recommend antibiotic chemoprophylaxis to prevent secondary cases (or treatment if already symptomatic).
- Provide information about the disease, its transmission, and methods of prevention.
- Promptly identify clusters or outbreaks of disease and initiate appropriate prevention and control measures.

### **A. Case Investigation / Forms**

- Organized health departments have primary responsibility for investigating cases in their jurisdiction.
- Public health nursing services should consult their CDPHE Regional Epidemiologist to establish primary responsibility for investigating cases in their jurisdiction.
- Interview case or case's guardian to determine whether the case's symptoms are compatible with pertussis.

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- Use the CDC [Pertussis Surveillance Worksheet](#) during the interview to ensure collection of all pertinent information. The worksheet and instructions for completing the worksheet are available on the CD Manual website.
- If multiple attempts to obtain case information are unsuccessful (e.g., the case, case's guardian or healthcare provider does not return your calls, or the person refuses to divulge information), contact your CDPHE Regional Epidemiologist to discuss the situation.
- Recommend appropriate antibiotic treatment for the case if the case has not been treated. See Section 6 (A) - Treatment, for appropriate antibiotics.
- Treatment is not necessary if the case has coughed more than 21 days, however, treatment may still be considered for high-risk pertussis cases. See Section 2 - Case Definition, for definition of high-risk cases.
- Recommend exclusion from school or childcare until the case has completed 5 days of an appropriate antibiotic, or until 21 days after cough onset if antibiotics are not taken, or until coughing stops (whichever comes first).
- Recommend exclusion from work if the case is unable to do their job without exposing other individuals. In these situations, cases should be excluded from work until they have completed 5 days of an appropriate antibiotic, or until 21 days after cough onset if antibiotics are not taken, or until coughing stops (whichever comes first). Exclusion is especially important for employees in high-risk occupations (e.g., health care worker, school teacher, childcare center staff).
- Re-interview suspect, probable, or confirmed pertussis cases if they did not meet the clinical case definition (had not coughed 14 days or did not have a paroxysmal cough) at the initial interview.
- Complete all sections of the CDC [Pertussis Surveillance Worksheet](#) for confirmed and probable cases.
- All information on the front of the worksheet should be entered into CEDRS or completed worksheets may be faxed or mailed to CDPHE.
- For cases that do not survive their pertussis infection, complete the 2-page [Pertussis Death Worksheet](#) and obtain copies of the hospital discharge summary and autopsy report (if an autopsy is performed). The [Pertussis Death Worksheet](#) is located on the CD Manual website. The worksheet, discharge summary, and autopsy report should be faxed or mailed to CDPHE.
- CDPHE staff will obtain a copy of the death certificate for deceased pertussis cases.

### **B. Identify and Evaluate Contacts**

The main focus of pertussis investigations is to prevent the spread of pertussis to close contacts and high-risk contacts, especially infants who are more likely to be unimmunized and have severe complications. All contacts should be evaluated to determine if they are close contacts or high-risk contacts and whether they have pertussis symptoms. Antibiotic prophylaxis/treatment is recommended for all close contacts and high-risk contacts of a pertussis case, regardless of age, immunization status, or disease history. See Section 2 - Case Definition for definition of high-risk case.

- The following are examples of pertussis exposures of close contacts:
  1. Direct face-to-face contact for an undefined time period with an infectious pertussis case (case coughing < 21 days and has not completed 5 days of appropriate antibiotic treatment).
  2. Shared confined space in close proximity for a prolonged period of time, such as  $\geq 1$  hour, with an infectious pertussis case. For example, riding in a car with a pertussis case.

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3. Direct contact with respiratory, oral, or nasal secretions from an infectious pertussis case (e.g., an explosive cough or sneeze in the face, sharing food, sharing eating utensils, kissing, mouth-to-mouth resuscitation, or performing a full medical exam including examination of the nose and throat without wearing a mask).
- Obtain information about the case's close contacts (household, relatives, significant other, friends, etc.), high-risk contacts, and the case's activities (school, work, childcare, church, social gatherings, travel, etc.) during the case's infectious period.
- Record names, ages, county (city or address) and phone numbers of all close contacts and high-risk contacts. All contacts determined to be pertussis cases will need to be investigated and reported to CDPHE.
- For each activity, record the facility's name, phone number, and a contact person.
- Information about contacts and activities occurring outside the investigator's county/area should be given to the appropriate county health department or nursing service or CDPHE.
- CDPHE should be notified of all out-of-state close contacts.
- Contacts or their guardian should be interviewed to determine if the contact has any symptoms of pertussis (including mild or slight cough) or meets the pertussis case definition.
- If multiple attempts to obtain information on the contact(s) are unsuccessful (e.g., the contact, contact's guardian or healthcare provider does not return your calls, or the person refuses to divulge information), contact your CDPHE Regional Epidemiologist to discuss the situation.

## **1. Symptomatic Contacts**

Close contacts with a paroxysmal cough or the early symptoms of pertussis (cold symptoms with a mild or slight cough) are considered symptomatic contacts.

- Treat symptomatic contacts as possible pertussis cases. See Section 5 (A) – Case Investigation / Forms, regarding antibiotic treatment, exclusion, re-interviewing of cases, completing surveillance forms, and CEDRS data entry for pertussis cases.
- If possible, collect specimens for lab testing from symptomatic contacts. This is especially important if the contact may spread pertussis to a new setting (i.e., a new school or childcare facility) or if the person is a contact to a probable (i.e., not lab confirmed) case.
- Recommend DTaP/Tdap vaccination as appropriate for children, adolescents, and adults with mild symptoms. See Section 6 (B2) - Vaccination.
- Symptomatic contacts of lab confirmed cases whose symptoms match the clinical case description in Section 2 - Case Definition (paroxysmal cough and cough duration of  $\geq 14$  days) are considered confirmed cases.
- Symptomatic contacts of probable cases whose symptoms match the pertussis clinical description (paroxysmal cough and cough duration of  $\geq 14$  days) are suspect cases, unless the contact is diagnosed with pertussis by a health professional, has positive lab results, or is part of an outbreak. See Section 2 - Case Definition, for clinical description and outbreak definition.
- Symptomatic contacts whose symptoms don't match the clinical description in Section 2 - Case Definition are considered suspect cases.

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## **2. Asymptomatic Contacts**

Asymptomatic contacts are close contacts without a cough. Close contacts with a mild or slight cough are considered symptomatic contacts.

- Recommend antibiotic prophylaxis for asymptomatic close contacts if the last exposure occurred less than 21 days (one incubation period) ago. Prophylaxis may be considered for high-risk contacts exposed more than 21 days ago. See Section 6 (B1) - Antimicrobial Prophylaxis.
- Recommend DTaP/Tdap vaccination as appropriate for children, adolescents, and adults who are asymptomatic contacts. See Section 6 (B2) - Vaccination.
- Exclusion of asymptomatic contacts from school, childcare, or work is not necessary, unless they develop a cough within the first 5 days of their antibiotic prophylaxis.
- Testing asymptomatic contacts for pertussis is not necessary.
- If initial interview of an asymptomatic contact occurred < 21 days after their last pertussis exposure, ideally, they should be re-interviewed 21 days following their exposure to determine whether they have remained disease free. An alternative is to ask the asymptomatic contact or their guardian to notify you if the person develops a cough after the initial interview.

## **C. Reported Incidence is Higher than Usual/Outbreak Suspected**

During a pertussis investigation, it is common to discover other household members with pertussis symptoms. Spread of pertussis outside the household should be considered an outbreak. An outbreak is defined as two or more cases involving two or more households clustered in time (e.g., occurring within 42 days of each other) and either epi-linked or sharing a common space (e.g., in one building) where transmission is suspected to have occurred (e.g. a school). One case in an outbreak must be lab confirmed (PCR positive and meets case definition, or culture positive). In an outbreak setting, a case may be defined as an acute cough illness lasting  $\geq 2$  weeks without other symptoms.

# **6) DISEASE CONTROL MEASURES**

## **A. Treatment**

Appropriate antibiotic treatment (see table – next page) is recommended for all pertussis cases and their symptomatic close contacts (if they have been coughing < 21 days) to render them non-infectious. Appropriate antibiotics will not reduce cough symptoms unless taken in the catarrhal (early) stage of pertussis. Infected persons may still be contagious during the first 5 days of antibiotic treatment. Treatment may not be necessary if pertussis cases and/or their symptomatic close contacts have already coughed 21 days, as they would be considered non-infectious. In high-risk situations, antibiotic treatment may be considered for high-risk cases having coughed up to 42 days, and for high-risk contacts having their last exposure up to 42 days ago.

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<b>RECOMMENDED REGIMENS FOR TREATMENT OR PROPHYLAXIS OF PERTUSSIS</b>				
Preference	Drug	Age Group	Dosage	Duration
<b>1<sup>st</sup> choice(s):</b>	Azithromycin (Zithromax)	< 1 month <sup>+</sup>	10 mg/kg in single dose <i>(Preferred drug; limited safety data available)</i>	5 days
		1 – 5 months	10 mg/kg in single dose	5 days
		≥ 6 months	10 mg/kg in single dose on day 1 (maximum =500mg) <b>and</b> then 5 mg/kg in single dose (maximum=250mg) on days 2-5	5 days
	Clarithromycin (Biaxin)	< 1 month <sup>+</sup>	Not recommended <i>(Safety data unavailable)</i>	NA
		≥ 1 month	15 mg/kg/day in 2 divided doses (maximum 500mg/dose)	7 days
<b>2<sup>nd</sup> choice:</b>	Erythromycin	< 1 month <sup>+</sup>	<i>Not usually recommended, use associated with increased risk of IHPS*. Only use as alternate drug for infants &lt; 1 month using same dosage and duration listed for ≥ 1 month of age.</i>	NA
		≥ 1 month	40-50 mg/kg/ day in 4 divided doses (maximum 2 gm/day)	14 days
<b>3<sup>rd</sup> choice:</b>	Trimethoprim-sulfamethoxazole (Bactrim or Septra)	< 2 months	<i>Should not be used due to risk of kernicterus.</i>	NA
		≥ 2 months <sup>¶</sup>	8 mg/kg/day of trimethoprim (maximum =320mg), sulfamethoxazole 40mg/kg/day (maximum =1600) in 2 divided doses.	14 days
<p><sup>+</sup> All infants &lt; 1 month of age who receive any macrolide should be monitored for development of IHPS.  <sup>*</sup> Infantile hypertrophic pyloric stenosis.  <sup>¶</sup> Trimethoprim-sulfamethoxazole should not be given to pregnant women, nursing mothers or infants &lt; 2 months of age due to the risk of kernicterus.</p>				
<p><b>For purposes of release from isolation, 5 days of treatment is required</b> (regardless of which antibiotic is prescribed). The release from isolation assumes 100% compliance. The dosages as provided above should be used.</p>				
<p><b>Note:</b> Please refer to the Physicians' Desk Reference (PDR) or a pharmacist for information regarding contraindications to these antibiotics.</p>				
<p><b>Reference</b> Centers for Disease Control and Prevention. Recommended Antimicrobial Agents for the Treatment and Prophylaxis of Pertussis, 2005 CDC Guidelines. <b>MMWR</b> 2005; 54 (No. RR-14): 1-16.</p>				

The above table is included in the one-page CDPHE [Guidance on the Treatment and Prophylaxis of Pertussis Cases and Contacts](#) document, which is available on the CD Manual website.

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Please refer to the Physicians' Desk Reference (PDR) or a pharmacist for information regarding contraindications to the antibiotics for pertussis treatment and prophylaxis. Infantile hypertrophic pyloric stenosis (IHPS) in infants < 1 month of age has been reported following the use of oral erythromycin. Physicians prescribing macrolides (azithromycin, clarithromycin, or erythromycin) to newborns should inform parents about the possible risk for IHPS and counsel them about signs of IHPS, such as projectile vomiting or excessive irritability.

### **B. Prophylaxis**

#### **1. Antimicrobial prophylaxis**

- Antibiotic prophylaxis is recommended to abort possibly incubating infection for all asymptomatic close contacts and high-risk contacts of pertussis cases, regardless of their age, immunization status, or history of pertussis disease. This is especially important if the contact has the potential to expose young children if the contact became contagious with pertussis .
- The same antibiotics and dosages used for pertussis treatment are recommended for pertussis prophylaxis.
- See the Recommended Regimens for Treatment or Prophylaxis of Pertussis table on the previous page. This antibiotic treatment and prophylaxis table is included in the one-page CDPHE [Guidance on the Treatment and Prophylaxis of Pertussis Cases and Contacts](#) document, which is available on the CD Manual website.
- Prophylaxis of close contacts is not necessary if the last exposure occurred more than 21 days (one incubation period) ago, however, prophylaxis may still be considered for high-risk contacts.
- Asymptomatic close contacts of pertussis cases that develop a cough during the first five days of taking antibiotic prophylaxis should be considered infectious until they have completed 5 days of antibiotics or stopped coughing (whichever occurs first).
- Asymptomatic close contacts that become symptomatic should be treated as suspect pertussis cases and excluded from childcare, school, and/or possibly work. See Section 5 (B1) - Symptomatic Contacts.

#### **2. Vaccination**

Protection after DTP/DTaP vaccination wanes over time, resulting in little or no protection 5 to 10 years following the last dose. Until 2005, there was not a pertussis vaccine licensed for use in persons  $\geq 7$  years of age. In 2005, the FDA licensed two Tdap vaccines for use as a **single dose booster** in adolescents and adults, BOOSTRIX® (licensed for persons 10-18 years of age) and ADACEL™ (licensed for persons 11-64 years of age). For additional information regarding Tdap vaccination see **Preventing Tetanus, Diphtheria, and Pertussis Among Adolescents: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines, Recommendations of the Advisory Committee on Immunization Practices (ACIP)** at [www.cdc.gov/mmwr/preview/mmwrhtml/rr5503a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5503a1.htm) or **Preventing Tetanus, Diphtheria, and Pertussis Among Adults: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine** at [www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm).

- In addition to antibiotic prophylaxis, recommend a dose of DTaP/Tdap vaccine for contacts of a case that are not age appropriately immunized.
- Children less than 7 years of age whose last DTaP vaccination was more than 3 years ago should be vaccinated.

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- Tdap vaccine is recommended for adolescents and adults, who have been exposed to pertussis or are part of a pertussis outbreak, are between 11 and 64 years of age, and have not received a previous Tdap immunization.
- Recommendations for Tdap use encourage a 5-year interval between Td and Tdap vaccination to reduce the risk of local or systemic reactions, however, intervals less than 5 years may be used when there is an increased risk of pertussis, such as pertussis exposure or outbreak.
- The safety of intervals as short as 2 years between Td and Tdap vaccinations is supported by 3 Canadian studies of children and adolescents.
- Neither vaccination nor natural disease confers complete or lifelong protective immunity against pertussis or reinfection.
- Immunization after exposure to pertussis will not prevent infection.

## C. Education

- Advise contacts of signs and symptoms of pertussis, the possible need for antibiotic prophylaxis or treatment, and DTaP/Tdap vaccination.
- Two CDPHE sample letters located on the [Pertussis website](#); **Pertussis Disease Alert, Important Notice to Parents** and **Pertussis Disease Alert, Important Notice to Parents of Children Needing Preventive Antibiotics**, include pertussis symptoms, antibiotic recommendations, and vaccination information.
- A pertussis fact sheet, [Facts About Pertussis \(Whooping Cough\)](#), is also located on the Pertussis website.
- A Health Alert Network (HAN) Advisory about pertussis may be sent to physicians during a large or unusual pertussis outbreak. Sending a pertussis HAN should be discussed with your CDPHE Regional Epidemiologist, who may assist you in developing the alert.

## D. Managing Special Situations

### 1. Childcare / Preschool

Refer childcare providers to the Colorado Department of Public Health and Environment guidelines for child care providers, [Infectious Disease in Child Care Settings: Guidelines for Child Care Providers](#) (<http://www.cdphe.state.co.us/dc/Epidemiology/ChildCareflipchart02a.pdf>) or the pertussis fact sheet, [Facts About Pertussis \(Whooping Cough\)](#) for additional pertussis information. Determine the dates the pertussis case attended childcare and when the case was infectious. If the case attended childcare while infectious, determine which children and staff need antibiotic prophylaxis. Each situation should be evaluated individually.

- Exclude the case from childcare/preschool until they are noninfectious (after 5 days of appropriate antibiotic treatment, or 21 days after cough onset if antibiotics are not taken, or until cough stops [whichever comes first]).
- In a large childcare facility, antibiotic prophylaxis is recommended for children and staff in the case's classroom.
- If the case mixed with children from other classrooms while infectious, antibiotic prophylaxis of these individuals may be considered, depending on the type and duration of the activity (typically, antibiotic prophylaxis would not be recommended for playing outside at the same time).
- In a small childcare facility or home childcare setting, antibiotic prophylaxis is recommended for the childcare provider(s) and all the attendees.

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- In some home childcare settings, antibiotic prophylaxis of the provider's household members may be recommended if the household members had close contact with the case.
- Educate parents about the signs and symptoms of pertussis, contacting their health care provider if their child develops symptoms, and reviewing immunization records.
- Inform staff about pertussis signs and symptoms, contacting their health care provider if they develop symptoms, and reviewing their immunization records.
- The CDPHE sample letter **Pertussis Disease Alert, Important Notice to Parents of Children Needing Preventive Antibiotics** may be used to notify parents of childcare contacts needing antibiotic prophylaxis and educate them about pertussis. This sample letter is located on the CD Manual website.
- The **Pertussis Fact Sheet** or the CDPHE sample letter, **Pertussis Alert to Parents**, may be sent to parents of children in unexposed classrooms if the childcare center director wants to notify all parents.
- Childcare staff and/or health department personnel should review the DTaP/Tdap immunization records of all children and staff at the facility. If unable to review records for the whole facility, review immunization records of the children and staff in the exposed classroom.
- Childcare staff and/or health department personnel should contact the parents' of children not up to date on their DTaP vaccinations and refer them to their health care provider or the local public health agency for immunization.
- Exposed symptomatic contacts should be excluded from childcare until they have completed 5 days of appropriate antibiotic treatment, or have coughed for 21 days, or have stopped coughing (whichever comes first). There may be unusual circumstances in home childcare settings where all the contacts are coughing and exclusion of symptomatic contacts may not be required.
- Childcare personnel should increase monitoring for cough illness at the facility.
- Unexposed symptomatic individuals should be evaluated by their health care provider and should be tested if pertussis is suspected.
- Before and after school childcare facilities and classrooms should follow the guidelines for school situations in Section 6 (D2) – School, below.

### 2. School

Refer school personnel to the CDPHE **Infectious Disease Guidelines for School Personnel** ([http://www.cdphe.state.co.us/dc/Epidemiology/manual/School\\_Guidelines.pdf](http://www.cdphe.state.co.us/dc/Epidemiology/manual/School_Guidelines.pdf)) or the pertussis fact sheet, **Facts About Pertussis (Whooping Cough)** for additional pertussis information. Each school situation should be evaluated individually. Determine the dates the pertussis case was infectious and if the case attended school during their infectious period.

- Exclude the case until they are noninfectious (after 5 days of appropriate antibiotic treatment, or 21 days after cough onset if antibiotics are not taken, or until cough stops [whichever comes first]).
- Notify the school nurse or health aide or person responsible for health issues at the school (secretary, principal, etc.) about the case and discuss possible school exposures and disease control strategies.
- Determine whether the case is with one group of classmates all day or attends multiple classes with many different students.

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- Determine whether the case is involved in extra-curricular school activities, such as sports teams, clubs, etc.
- Antibiotic prophylaxis is not routinely recommended for school classroom contacts, unless certain individuals meet the criteria of close contacts (see Section 5 [B]) or high-risk contact (see Section 2), however, each situation needs to be evaluated individually. In some situations, antibiotic prophylaxis has been recommended for classrooms, sports teams or clubs; for example, multiple cases in a class/group, kindergarten classrooms, special education classrooms, school choir, cheerleaders, and football teams.
- Educate parents, students, and staff about the signs and symptoms of pertussis, contacting their health care provider if symptoms develop, and reviewing immunization records.
- The CDPHE sample letter, **Pertussis Disease Alert, Important Notice to Parents**, may be used to notify and educate parents about pertussis. This letter is located on the CD Manual website.
- Discuss with school personnel whether notification letters should be sent to school contacts.
- If letters are being sent, discuss whether the letters should be sent to the entire school or only the case's classroom(s). Some school administrators prefer to notify the entire school about pertussis cases, especially if liability may be an issue.
- In large middle and high schools, it may be easier to notify the entire school than to determine which individuals may have been exposed, since students attend multiple classes.
- If sending a notification letter to all students in a large school, consider including the case's grade level in the letter. This may reduce phone calls from parents to the school and/or local public health agency.
- Articles in school newsletters are another method of informing parents about pertussis; however, newsletters may not be timely if sent out monthly or quarterly.
- Some schools may notify parents using an automatic dialing system.
- School health personnel should increase surveillance for cough illnesses by asking staff members to report students with prolonged or unusual coughs.
- Refer exposed symptomatic classmates and staff to their health care provider for evaluation of possible pertussis.
- Persons determined to have pertussis should be treated as pertussis cases. See Section 5 (A) – Case Investigation / Forms, regarding antibiotic treatment, exclusion, re-interviewing of cases, completing surveillance forms, and CEDRS data entry for pertussis cases.
- School staff and/or health department personnel may want to review the DTaP/Tdap immunization records of exposed classmates. In some situations immunization records of all students may be reviewed.
- School staff and/or health department personnel may want to contact the parents' of students who are not up to date on their DTaP/Tdap vaccinations and refer them to their health care provider or the local health department for immunization.
- Inform staff and parents of students of the availability of Tdap vaccine. The CDPHE sample letter, **Pertussis Alert, Important Notice to Parents** discusses Tdap vaccine.

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### **3. Patients and Staff in Health Care Facilities (Hospitals and Long Term Care Facilities)**

Hospitals and long term care facilities generally have written infection control policies and procedures for handling cases of communicable disease among patients and staff members. If a facility does not have such policies in place, provide the following recommendations:

- Standard and droplet precautions (respiratory isolation) are recommended for five days after the initiation of appropriate antibiotic treatment for hospitalized cases and cases in residential facilities.
- Standard and droplet precautions may not be necessary if a case in a residential facility has already coughed 21 days.
- Identify health care workers and staff having close contact with the case while the person was infectious and not in respiratory isolation (or staff not following respiratory precautions).
- Close contact includes activities such as performing a physical examination, suctioning, intubation, bronchoscopy, feeding, bathing, and other procedures requiring prolonged or close interaction.
- Infection Control and/or Employee Health staff typically assess the need for and administration of antibiotic prophylaxis of exposed staff.
- Exposed health care workers and staff who develop a cough should be tested for pertussis and excluded from work (or excluded from contact with other individuals) until completing five days of appropriate antibiotic treatment. Employees may return to work earlier if determined not to have pertussis.
- Exposed symptomatic staff unable to take appropriate antibiotic treatment should be excluded from work (or excluded from contact with other individuals) until they have coughed 21 days or stopped coughing (whichever comes first).
- Identify patients or residents who had close contact with the pertussis case and recommend antibiotic prophylaxis.
- Exposed hospital patients who have been discharged may be notified through the patients' primary care physicians.
- Exposed symptomatic contacts (patients or residents) should be treated as pertussis cases. They should be isolated and evaluated (including testing) for pertussis.
- Exposed patients or residents developing a cough during the first five days of antibiotic prophylaxis should be evaluated for pertussis and isolated until completing five days of antibiotics.
- Asymptomatic exposed patients or residents unable to take antibiotic treatment or prophylaxis should be under cough surveillance for 21 days, or possibly 42 days if they are a high-risk contact.
- Symptomatic exposed patients or residents unable to take antibiotics treatment should be isolated until they have coughed 21 days or stopped coughing (whichever comes first).

### **E. Environmental Measures**

- No specific environmental measures are recommended.

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