PERTUSSIS

Also known as: Whooping Cough

Responsibilities:
Hospital: Report by IDSS, facsimile, phone, or mail
Lab: Report by IDSS, facsimile, phone, or mail
Physician: Report by facsimile, phone, or mail
Local Public Health Agency (LPHA): Report by IDSS, **Follow-up required**

Iowa Department of Public Health
Disease Reporting Hotline: (800) 362-2736
Secure Fax: (515) 281-5698

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Agent

Pertussis is caused by *Bordetella pertussis*, a gram-negative bacillus.

B. Clinical Description

Symptoms: Pertussis symptoms may vary by illness stage as described below:

- ***Catarrhal stage***: This is the most contagious stage of pertussis. The illness begins insidiously, similar to a common cold, with cough, sneezing, and/or a runny nose, sometimes lasting up to two weeks.
- ***Paroxysmal stage***: The classic symptoms start with a whooping cough of five to 15 consecutive coughs per single breath, followed by a high-pitched whoop as the person deeply inhales. Moments later another round of coughing occurs, sometimes accompanied by gagging and vomiting. The infected person usually appears normal between attacks. The cough is usually worse at night. Fever is most often absent or minimal throughout the course of the disease. The paroxysmal stage can last one to six weeks.
- ***Convalescent stage*****:** This stage can persist for three weeks to three months (seven weeks on average). Even after recovery, classic coughing episodes may recur for months. This is usually because the person is developing another upper respiratory infection that may irritate the previously damaged airways.

The clinical presentation of pertussis is variable and its diagnosis challenging.

- Infants under six months old may present with apnea and cyanosis rather than a whooping cough, and usually appear quite ill.
- Older children and adults also can have atypical manifestations, with persistent cough lasting > two weeks with no whoop, or they may present with more classical symptoms. They may also present with milder symptoms that mimic bronchitis or asthma.

Onset: Pertussis onset is acute or insidious with an irritating cough.

Complications: Complications from pertussis include pneumonia, seizures, encephalopathy, and death.

Duration: With or without treatment, the illness persists for three weeks to three months; the average duration is seven weeks.

C. Reservoir

Humans are the only known reservoir.

D. Modes of Transmission

Spread: Pertussis is most commonly spread by contact with respiratory droplets or by contact with airborne droplets of respiratory secretions. It occurs rarely by contact with an infected person's freshly contaminated articles.

E. Incubation Period

The incubation period is usually nine to 10 days, with a range of six to 20 days.

F. Period of Communicability or Infectious Period

Persons with pertussis are most infectious during the catarrhal period and the first two weeks after cough onset (i.e., approximately 21 days). For the purpose of surveillance and workup: The person is most efficient at spreading disease once the cough begins. To determine the period of communicability, take cough onset and go out 21 days or until person has completed the first five full days of an appropriate antibiotic.

G. Epidemiology

- Young infants (particularly preterm infants) are at highest risk for acquiring clinical pertussis and associated complications. Adolescents and adults are often the source of infection for infants.
- Pertussis occurs worldwide. It is endemic, with peaks occurring every two to five years.
- Pertussis exhibits no distinct seasonality in the U.S.; however, it may increase in the summer and fall.
- Long-term carriage (i.e., several months) of B. pertussis probably does not occur. However, it has been documented that persons can become infected and remain asymptomatic. Transmission from asymptomatic infected persons to others may occur but is less likely than for symptomatic persons since asymptomatic persons do not have a cough.
- Pertussis is highly infectious, with secondary attack rates of 80 to 90 percent among susceptible household contacts.
- Pertussis vaccine is 70 to 90 percent effective. Immunity wanes five to 10 years after the last dose of pertussis vaccine is given.

H. Bioterrorism Potential

None.

2) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify sources and sites of transmission and any additional cases.
- To identify close contacts and recommend prophylaxis for those at risk for severe complications due to pertussis or those who may come in contact with those at risk for severe complications due to pertussis.
- To monitor the effectiveness of outbreak control strategies.
- To provide data for monitoring the effectiveness of new vaccine formulations.
- To analyze vaccination status by age to determine whether the problem is predominantly failure to vaccinate or vaccine failure.
- To characterize the epidemiology of pertussis disease in Iowa.

B. Laboratory and Healthcare Provider Reporting Requirements

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare

provider must report. The preferred method of reporting is by utilizing the Iowa Disease Surveillance System (IDSS). However, if IDSS is not available, the reporting number for IDPH Center for Acute Disease Epidemiology (CADE) is (800) 362-2736; fax number (515), 281-5698, mailing address: IDPH, CADE
Lucas State Office Building, 5th Floor
321 E. 12th St.
Des Moines, IA 50319-0075

Reporting forms are available at:
http://healthclrhouse.drugfreeinfo.org/cart.php?target=category&category_id=295.

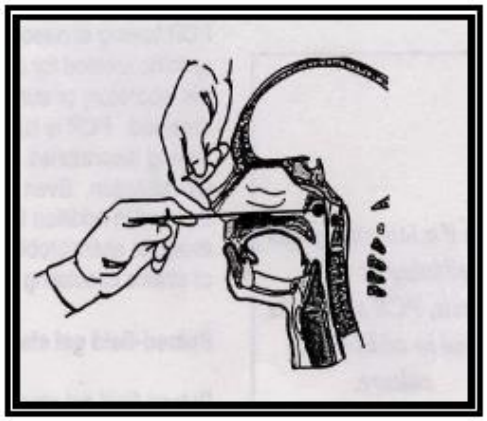
C. Laboratory Testing:

- Who should be tested for pertussis?
  - Any person presenting with symptoms consistent with pertussis, regardless of contact with a case or an outbreak situation.
- Who should not be tested for pertussis?
  - Asymptomatic persons, regardless of contact with a case or an outbreak situation.
- Do symptomatic contacts of laboratory confirmed cases need to be tested?
  - It is not necessary to test the first "ring" out from a laboratory confirmed case if the contact was exposed while the lab confirmed case was infectious, proper incubation time has elapsed, and the signs and symptoms are compatible with pertussis.
  - It is recommended that the second "ring" out from a laboratory confirmed case be tested (e.g., contacts of a contact of a laboratory confirmed case).
- What test should be performed?
  - Polymerase chain reaction (PCR) testing is recommended and should be used for laboratory confirmation.
  - Serologic testing is not yet standardized and is not widely available. Due to lack of association between antibody levels and immunity to pertussis, results of serologic testing are difficult to interpret.
- Where can testing be performed?
  - PCR testing is available at the State Hygienic Laboratory. For more information on testing services provided by SHL, call 319-335-4500 or visit: www.shl.uiowa.edu/.
- Specimen Collection and Handling:
  - PCR is a very sensitive test and precautions should be taken to prevent cross-contamination of specimens (i.e., changing gloves and use of sterile scissors or decontamination of scissors using bleach solution) for each patient.
  - If possible, specimens should be collected prior to start of antibiotic treatment. However, PCR detects both live and dead bacteria, so it does not indicate active disease.
  - A properly obtained nasopharyngeal swab, wash, or aspirate is essential for optimal test results. Collection and handling instructions for each specimen type are described below.
  - Nasopharyngeal swab testing kits consisting of slides, media and swabs in mailing containers can be ordered from the State Hygienic Laboratory at (319) 335-4500.

Nasopharyngeal Swab:

1. Gently insert nasopharyngeal swab into a nostril until the posterior nasopharynx is reached. Use a dacron or calcium alginate swab, not cotton.
2. Leave the swab in place for 10 to 30 seconds.

3. Slowly remove with a rotating motion.
4. Place swab tip into 1.5 ml screw cap tube. Cut the excess length of the wire shaft with a sterile scissors, and cap the tube tightly. Treatment of scissors with 10 percent bleach prior to use is effective in removing contamination with bacterial DNA from other sources.
5. Repeat process to collect a second swab, and place in the glass vial containing the Regan-Lowe transport medium. Cut off excess length of shaft, and cap the tube tightly.
6. If the kit does not contain Regan-Lowe transport medium, then place second swab in the replicate 1.5 ml screw cap tube provided in the kit.
7. Label specimens, wrap in absorbent material, and place in a biohazard bag and seal. Use a single biohazard bag for each patient's specimens. Place the completed Test Request Form in the outside pocket of the biohazard bag.



Nasal Wash: Instill several milliliters of sterile saline into nostrils while patient's head is tilted back. Bring patient's head forward and catch saline flowing from the nostrils in a small container. Pour specimen (minimum volume 0.2 ml) into the 1.5 ml sterile tube contained in the kit.

Nasopharyngeal Aspirate: A small catheter with a suction trap or bulb aspirator is inserted through the nostrils into the nasopharynx. Apply suction while slowly removing the catheter or aspirator tip. The catheter or aspirator should be flushed with sterile saline or viral transport medium and contents (minimum volume 0.2 ml) placed into the 1.5 ml sterile tube contained in the kit.

- Test result interpretation:

  Positive results indicate that the bacterium was detected in the specimen.

  Negative results indicate that the bacterium was not detected in the specimen. Note: negative results may occur if the patient is tested greater than three weeks after symptom onset.

  Equivocal results occur occasionally, meaning the PCR test does not clearly indicate a positive OR negative result. The clinician must then determine if the clinical symptoms and epidemiologic factors indicate a likely pertussis diagnosis or not. Public health follow up should depend on this determination.

  Indeterminate results rarely occur. Indeterminate results are generally caused by an inadequate specimen or interfering substances in the specimen that inhibited the reaction. Retesting can be considered. Ultimately, the clinician must determine if the clinical symptoms and epidemiologic factors indicate a likely pertussis diagnosis or not. Public health follow up should depend on this determination.

D. Local Public Health Agency (LPHA) Follow-Up Responsibilities

Case Investigation

1. Pertussis follow-up and case investigation is undertaken by the local public health agency (LPHA) and coordinated, if necessary, with IDPH Center for Acute Disease Epidemiology (CADE).
2. LPHA is responsible for conducting pertussis follow-up. Case investigation includes but is not limited to the following steps.
   a. Confirm the case's diagnosis.
   b. Conduct the case interview, using the case interview form included this chapter and also in the Iowa Disease Surveillance System (IDSS).
   c. Identify all household contacts, close contacts at high risk of developing severe illness, and contacts who themselves have close contact with individuals at high risk.
   d. Determine whether any of the identified contacts are symptomatic.
      - Recommend prophylaxis for asymptomatic close contacts (See *Section 3. C. Post Exposure Antimicrobial Prophylaxis Recommendations* on page 7*)*.
      - Symptomatic contacts should receive antibiotic treatment, possibly test, and be isolated until they have completed the first five days of the full course of an appropriate antibiotic (symptomatic contacts who refuse antibiotics should stay home through 21 days after cough onset). Symptomatic contacts are considered "epi-linked cases" and should be investigated as new cases and reported accordingly into the Iowa Disease Surveillance System (IDSS).
      - If symptomatic contacts have already coughed for more than 21 days at the time of diagnosis, the individual is no longer contagious to others. In most cases neither treatment nor isolation are indicated *(See Section 3. B. Recommended Treatment Protocol* on page 6 and *Section 3. C. Post Exposure Antimicrobial Prophylaxis Recommendations* on page 7*.)*
   e. Use the Iowa Disease Surveillance System (IDSS) to complete the Pertussis Case Investigation form. If IDSS is not available, paper forms can be used. This will drive the investigation. If paper forms are used, fax to the Center for Acute Disease Epidemiology (CADE) at (515)281-5698.

Contact the assigned field epidemiologist with questions or if assistance is needed. (800-362-2736)

3) CONTROLLING FURTHER SPREAD AND PREVENTING DISEASE

A. Identifying close contacts and high risk populations

Close Contact: While each situation should be evaluated separately and exposure defined based on information acquired through the investigation, close contacts are generally defined as persons who:

- Shared confined space in close proximity with a symptomatic case patient for greater than one hour;
- Had direct face-to-face contact for a period (not defined) with a symptomatic case while they were infectious; or
- Had direct contact with respiratory, oral, or nasal secretions from a symptomatic case-patient (e.g., an explosive cough or sneeze in the face, sharing food, sharing eating utensils during a meal, kissing, mouth-to-mouth resuscitation, or performing a medical exam including examination of the nose and throat).

High Risk Populations: The following groups are generally considered to be at high risk of developing severe illness:

- Infants and women in their third trimester of pregnancy -- severe and sometimes fatal pertussis-related complications occur in infants aged <12 months, especially among infants aged <4 months. Women in their third trimester of pregnancy may be a source of pertussis to their newborn infant.
- All persons with pre-existing health conditions that may be exacerbated by a pertussis infection (for example, but not limited to immunocompromised persons and patients with moderate to severe medically treated asthma).

B. Recommended Treatment Protocol:
The symptoms of pertussis may be modified if treatment is begun early, during the catarrhal stage. If started later in the course of the illness, treatment will decrease the infectious period, but may not decrease the duration of cough or severity of disease.

If symptomatic people are already beyond their infectious period, which ends 21 days after cough onset, treatment is generally not beneficial. However, for certain high-risk settings or individuals (such as pregnant women in their third trimester or infants less than 12 months), healthcare providers may consider extending the period for initiating treatment up to six weeks after symptoms start.

A specific class of antibiotics called macrolides is most effective against pertussis. The table below summarizes recommended oral antibiotics and dosages by age group.

Summary of oral macrolide treatment by age group.
(Recommended Antimicrobial Agents for the Treatment and Postexposure Prophylaxis of Pertussis, 2005 CDC Guidelines, available at:
www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm?s_cid=rr5414a1_e)

Age group	Azithromycin	Clarithromycin	Erythromycin
<1 month	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available)	Not recommended. (safety data unavailable)	Not recommended. Erythromycin is associated with infantile pyloric stenosis. Use if azithromycin is unavailable. 40-50 mg/kg per day in 4 divided doses for 14 days
1-5 months	10 mg/kg per day in a single dose for 5 days.	15 mg/kg per day in 2 divided doses for 7 days.	40-50 mg/kg per day in 4 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.	15 mg/kg per day in 2 divided doses (maximum: 1 g per day) for 7 days.	40-50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days.
Adults	500 mg in a single dose on day 1, then 250 mg per day on	1 g per day in 2 divided doses for 7 days.	2 g per day in 4 divided doses for 14 days.

	days 2-5.		

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

- The recommended dose in children is trimethoprim 8 mg/kg/day, sulfamethoxazole 40 mg/kg/day in two divided doses for 14 days.
- For adults, the recommended dose is trimethoprim 320 mg/day, sulfamethoxazole 1600 mg/day in two divided doses for 14 days.

NOTE: Because of the risk of kernicterus, TMP-SMZ should not be given to pregnant women, nursing mothers, premature neonates, or infants <two months of age.

NOTE: Only limited data from small clinical trials are available that confirm the microbiologic effectiveness of macrolides in infants < six months of age with pertussis, who are more likely to be partially or unimmunized and whose colonization is more likely to be prolonged compared with older, previously immunized individuals with pertussis.

- Nevertheless, considering theoretical rationale, in vitro effectiveness, safety and clinical data in older individuals with pertussis, and treatment adherence issues, the macrolides listed above may be used as a first line agent in infants 1 to 6 months of age.
- For infants <1 month of age, the risk of developing severe pertussis and life threatening complications outweighs the potential risk of infantile hypertrophic pyloric stenosis (IHPS) that is associated with macrolide use. All infants <1 month of age who receive any macrolide should be monitored for the development of IHPS and, as with other antibiotics with limited experience, for other serious adverse events.

C. Post Exposure Antimicrobial Prophylaxis Recommendations

The primary goal of post exposure antimicrobial prophylaxis is to prevent death and serious complications from pertussis in individuals at increased risk of severe disease. Appropriate administration of antimicrobial prophylaxis to asymptomatic contacts can prevent symptomatic infection.

Prophylaxis is generally indicated when:

A. The asymptomatic contact was exposed to the case during the case's infectious period (<21 days after onset of cough in the case), and
B. The asymptomatic contact's last exposure to the infectious case occurred <21 days (one incubation period) ago.

However, at their discretion, healthcare providers could consider prophylaxis of high-risk close contacts up to six weeks after exposure.

Prophylaxis is generally recommended for the following groups, regardless of their immunization status:

1. All household contacts (within families, secondary attack rates have been demonstrated to be high, even when household contacts are current with immunizations),
2. Close contacts at high risk of developing severe illness, or
3. Close contacts who themselves have close contact with either infants under 12 months, pregnant women in their third trimester, or individuals with pre-existing health conditions that may be exacerbated by a pertussis infection.
4. All contacts in high risk settings that include infants (<12 months) or pregnant women in their 3rd trimester (such as neonatal intensive care units, childcare settings, and maternity wards).

*(*See *Section A. Identifying close contacts and high risk populations* on page 5, for further clarification of "close contacts" and "high risk")

A broader use of PEP may be recommended in rare situations. Please contact your field epidemiologist or CADE for consultation or questions regarding these situations.

The recommended antibiotics and dosage by age group is identical for treatment and prophylaxis. Therefore, refer to the table in Section 3.B Recommended Treatment Protocol on page 6 for the schedule.

D. Isolation

Cases:

- If the patient has already coughed for more than 21 days at the time of diagnosis, the individual is no longer contagious to others and isolation is not indicated.
- Cases who have been coughing fewer than 21 days should stay home (this includes exclusion from social settings such as school, child care, work, church, and the mall) until they have completed the first five days of the full course of an appropriate antibiotic. During this time, they also should not have visitors.
- Cases who refuse antibiotics should stay home (this includes exclusion from social settings such as school, child care, work, church, and the mall) through 21 days after cough onset. During this time, they should not have visitors.

Asymptomatic contacts:

- Prophylactic antibiotics are offered (to household contacts, close contacts at high risk of developing severe illness, and to close contacts who themselves have close contact with persons at high risk) to prevent others from becoming ill with pertussis or spreading the disease to those at high risk for severe disease.
- Therefore, asymptomatic close contacts are not contagious and they do not need to be excluded from social settings. They should be monitored for the development of symptoms.

Symptomatic contacts (Epi-link case):

- Symptomatic contacts should be referred to a physician for treatment and testing if appropriate (*See section 2.C. Laboratory Testing on page 3*).
- If symptomatic contacts have already coughed for 21 days at the time of diagnosis, the individual is no longer contagious to others and isolation is not indicated.
- Symptomatic contacts, who have coughed fewer than 21 days, should be placed on antibiotics, isolated to home, and considered infectious until having completed the first five days of the full course of an appropriate antibiotic.
- Symptomatic contacts who refuse antibiotics should stay home (this includes exclusion from social settings such as school, child care, work, church, and the mall) through 21 days after cough onset. During this time, they should not have visitors.
- If the physician defers antibiotics until diagnostic test results are available, the symptomatic contact should be excluded from social settings until results become available. If results are negative, the individual may return immediately unless the clinician makes the diagnosis of pertussis on the basis of clinical and epidemiologic data.

E. Vaccination and Preventive Measures

The focus of vaccination is the prevention of the spread of pertussis in general; therefore all contacts that are not up to-date with DTaP/DTP/Tdap should be brought up-to-date.

For current recommendations for vaccination, visit the IDPH Bureau of Immunization and Tuberculosis web page at: www.idph.state.ia.us/ImmTB/Immunization.aspx?prog=Imm&pg=ImmHome.

The follow points provide additional detail and clarification related to pertussis immunizations:

- Active immunization started after exposure will not protect against disease resulting from that exposure, but it is not contraindicated. It will decrease the risk for disease from future exposure. The best protection is obtained by adhering to the recommended schedule.
- Assess the immunization status of close contacts. Children who are unimmunized or underimmunized should have immunization initiated, completing the series with minimum intervals.
- Children who have received their third dose of DTP/DTaP ≥six months before exposure should receive a fourth dose.
- Supplemental vaccination is not recommended for children who are up-to-date for age.
- While the use of an accelerated routine schedule of pertussis vaccination for infants (e.g., aged <two months at initial vaccination) during pertussis outbreaks is considered an acceptable outbreak control measure, it is usually not recommended because it would not match the schedule of other needed vaccinations. DTaP vaccines are not licensed for use in infants less than six weeks of age. The impact of implementing an accelerated schedule is likely to be modest, but could result in some decrease in pertussis morbidity among infants between 14 weeks and six months of age.
- Pertussis vaccine does not protect against infection by *B. parapertussis*.
- Many experts recommend children (especially infants aged <12 months) who have had a history of pertussis disease complete the routine vaccination series for pertussis with DTaP. This is because the duration of protection from pertussis disease is unknown and the diagnosis of pertussis can be difficult to confirm, especially if testing methods other than PCR are used. At least one study found that infants (age<12 months) may have a suboptimal immune response following pertussis disease.

While routine vaccination is the best preventive measure against pertussis, good personal hygiene (which consists of proper hand hygiene, disposal of used tissues, etc.) is also important.

F. Managing Special Situations: While the basic principles of case investigation, treatment of cases, and close contact prophylaxis also apply to these settings, additional considerations are included below.

Schools and Preschools: (*If preschool is part of larger childcare setting, see child care center section below.*)

Pertussis outbreaks have occurred even with high vaccine coverage levels (persons with three or more doses of pertussis containing vaccine). Often outbreaks are not limited to a single class or grade. Attack rates vary by grade and school activities. Transmission in school settings may include other children, the teacher in the classroom, or other social groups such as athletic teams or clubs.

Prophylaxis recommendations follow those outlined in Section 3. C. Post Exposure Antimicrobial Prophylaxis Recommendations on page 7. When identifying close contacts, it is important to determine if there are any patterns of interaction that would increase exposure

time among a group (such as children living in the same neighborhood, riding the same bus, going to the same school, and participating in the same activities, etc.).

The following checklist should be used when investigating cases and outbreaks in school and preschool settings:

Work with the school nurse and appropriate teachers to take the following actions:

1. Identify close contacts among students and staff who interact directly with the case.
2. Evaluate close contacts (students and staff) for cough illness.
3. Refer close contacts to their healthcare provider for appropriate treatment, isolation, or prophylaxis (*see Section 3. B. Recommended Treatment Protocol on page 6, Section C. Post Exposure Antimicrobial Prophylaxis Recommendations page 7, and Section 3.D. Isolation on page 8*). A School/Childcare Close Contact Letter Template is included in this chapter for distribution among close contacts; these may be issued on the stationery of the local public health agency or the affected institution.

4. Consider sending a general notification home with all students, acknowledging that there has been a case of pertussis in the school and encouraging parents to ensure their children are "up to date" on vaccine (in particular the adolescent booster) and to be aware of signs and symptoms and what to do if they occur. A School-wide / Childcare-wide General Notification Pertussis Letter Template is included in this chapter; these may be issued on the stationery of the local public health agency or the affected institution.

5. Request that all teachers in the school refer coughing students to the nurse's office.

6. Maintain a pertussis surveillance log that includes a line listing for all symptomatic individuals with cough onset and duration, labs, antibiotic type and start and finish date, location (in schools, grade and home room), and other symptoms present. On a separate list, keep track of the close contacts**,** recording the names and locations of students and staff (classrooms, teams, etc.). See school contact letter included in this chapter.

NOTE: Close Contact letters that recommend consideration of prophylactic antibiotics given to minors should be accompanied by a phone or email to parents notifying them of the letter. This follow-up could be performed by secretarial staff, for example, and does not have to be done by a health professional. This additional phone or email communication is NOT necessary for the school-wide, general notification letter.

Childcare:

Usually children in child care centers have extensive contact with each other and it can be difficult to distinguish individuals with or without significant exposure.

Exposures occurring in child care settings without children less than 12 months of age (no infants in the childcare center) should be managed in accordance with Section 3.C. Post Exposure Antimicrobial Prophylaxis Recommendations on page 7.

For cases occurring in child care settings with children less than 12 months of age (there are infants in the childcare center), the recommendations are based upon whether children are divided into multiple classrooms.

- If there are multiple classrooms that do not intermingle, and:
    - The exposure occurs in a room with children less than 12 months of age, it is recommended that the case's entire class and assigned staff be considered close contacts and they should all be advised to receive prophylaxis (because they are or have contact close contact with a child less than 12 months).

  - The exposure occurs in a room with children greater than 12 months of age, all children should be considered exposed and prophylaxis should be managed in accordance with Section 3.C. Post Exposure Antimicrobial Prophylaxis Recommendations on page 7.
    - In this situation, it would be appropriate to distribute the School/Childcare Close Contact Letter Template to all children and staff assigned to the same classroom as the case.
  - In both cases, the School-wide / Childcare-wide General Notification Pertussis Letter Template should be distributed to all children and staff in the facility (all classrooms).

- If the child care center is not divided into separate classes, it is recommended that the entire center and all staff be considered close contacts and receive prophylaxis (because they have contact close contact with a child less than 12 months).
  - In this situation, the School/Childcare Close Contact Letter Template would be appropriate to distribute to all children/families and staff.

In home-based child care settings with at least one child less than 12 months of age, it is recommended that all children and all child care providers (including any members of the child care providers' families who had any contact with the case during their infectious period) receive prophylaxis.

- In this situation, the School/Childcare Close Contact Letter Template would be appropriate to distribute to all children/families and staff.

Offices and other facilities:
The basic principles of case and contact investigation, treatment of cases, and prophylaxis of close contacts apply (*see Section 3. B. Recommended Treatment Protocol on page 6, Section C. Post Exposure Antimicrobial Prophylaxis Recommendations page 7, and Section 3.D. Isolation on page 8*). A General Close Contact Letter Template for distribution among close contacts is included in this chapter; these may be issued on the stationery of the local public health agency or the affected facility.

Depending upon the situation and facility a general notification letter may also be appropriate. A General Pertussis Notification Letter Template is also included in this chapter; these may be issued on the stationery of the local public health agency or the affected facility.

NOTE: Close Contact letters, which recommend prophylactic antibiotics according to the high risk criteria, that are given to minors should be accompanied by a phone or email to parents notifying them of the letter. This follow-up could be performed by secretarial staff, for example, and does not have to be done by a health professional. This additional phone or email communication is NOT necessary for the general notification letter.

Healthcare Facilities:
In healthcare settings, surveillance should be initiated immediately after identification of a suspect case and continue through two incubation periods (42 days) after the date of cough onset in the last case. Healthcare provider's pertussis vaccination should be up-to date. A single dose of Tdap is recommended for all health care personnel who have not previously received Tdap as an adult.

Regardless of their vaccination status, healthcare providers should use appropriate masks in the presence of a patient with cough illness to prevent exposures from occurring.

- Healthcare workers exposed to a case who have appropriately followed Standard Precautions and Droplet Precautions (including wearing a mask) during close contact with the case, do not require prophylaxis.
- Recommendations for healthcare workers exposed to a case, who have not appropriately followed Standard Precautions and Droplet Precautions (did not wear a mask) during close contact with the case, are based upon the setting and patient populations they serve:
    - Asymptomatic healthcare workers, who work with patients at risk for severe pertussis (*see Section 3. A. Identifying close contacts and high risk populations on page 5*) should receive prophylaxis *(see Section 3. C. Post Exposure Antimicrobial Prophylaxis Recommendations on page 7*). Examples of these high risk settings would include neonatal intensive care units, cancer treatment units, and maternity wards.
    - Other asymptomatic healthcare workers, who do not work with high risk patients, can be monitored for 21 days after exposure and prophylaxis is not required. If the healthcare worker becomes symptomatic, they should be excluded immediately.
- When cases occur within healthcare facilities (i.e., a patient is hospitalized with pertussis):
    - Apply Droplet and Standard Precautions to all staff, patients, and families in close contact with the case.
      In healthcare settings, "close contact" is defined as the following:
        1. having face-to-face contact, within three feet of the case; this includes conducting a medical examination, obtaining a nasopharyngeal swab, suctioning, intubating, performing bronchoscopy or similar procedure without appropriate PPE;
        2. conducting any procedure that induces coughing of the case, even if farther from the case than three feet without appropriate PPE;
        3. coming into mucosal contact with respiratory, oral, or nasal secretions of the case directly; and
        4. sharing a room with the case.
    - The basic principles of case and contact investigation, treatment of cases, and prophylaxis of close contacts apply (*see Section 3. B. Recommended Treatment Protocol on page 6, Section C. Post Exposure Antimicrobial Prophylaxis Recommendations page 7, and Section 3.D. Isolation on page 8*).
    - Providers, department heads, infection prevention, employee health, and other relevant personnel/departments should be notified of the case.

Other:

Institutional Setting:

In institutional settings (e.g. correctional facilities), prophylaxis recommendations may vary depending upon this situation. Please contact your field epidemiologist or CADE for consultation or questions regarding these situations.

Repeat Exposures:

When continued transmission of pertussis is evident, multiple rounds of antibiotics are not recommended unless:

1) the close contact is determined to be at high risk, or
2) the close contact has close contact with persons at high risk.

(*Section 3. A. Identifying close contacts and high risk populations* on page 5)

Rather than repeating a course of antibiotics, close contacts determined not to be at high risk and not to have close contact with persons at high risk, should be monitored for onset of signs and symptoms of pertussis for 21 days.

ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Pertussis can be found at: www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top.

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

References

American Academy of Pediatrics. *Red Book 2009: Report of the Committee on Infectious Diseases, 28h Edition*. Illinois, American Academy of Pediatrics, 2009.
CDC. *Guidelines for the Control of Pertussis Outbreaks*. CDC, 2000.
CDC. Pertussis: Summary of Vaccine Recommendations. January, 2011 www.cdc.gov/vaccines/vpd-vac/pertussis/recs-summary.htm
Heymann, David L., ed., *Control of Communicable Diseases Manual, 20th Edition*. Washington, DC, American Public Health Association, 2015.
Honein, M.A., Paulozzi, L.J., Himelright, I.M., *et al*. Infantile hypertrophic pyloric stenosis after pertussis prophylaxis with erythromycin: a case review and cohort study. *Lancet* 1999; 354:2101–2105.
CDC: Epidemiology and Prevention of Vaccine-Preventable Diseases "Pink Book". Ninth edition, January 2006.

Additional Resources

CDC website providing Guidelines for the Control of Pertussis Outbreaks: www.cdc.gov/pertussis/outbreaks/guide/index.html

CDC Advisory Committee on Immunization Practices Link to recommendations including pertussis: www.cdc.gov/vaccines/pubs/ACIP-list.htm.