Health Department
1000 Lake View Drive, Suite 100
Wausau, WI 54403-6797

MARATHON COUNTY

Tel/TDD: 715-261-1900
Fax: 715-261-1901
www.co.marathon.wi.us

INCREASED INCIDENCE OF PERTUSSIS (WHOOPING COUGH)
IN MARATHON COUNTY

November 25, 2013

Since November 1, 2013, Marathon County Health Department has investigated 20 cases of laboratory confirmed pertussis in students attending several different schools and organized activities in the county.

As part of our follow-up we are referring close, face-to-face contacts of lab confirmed cases of pertussis to their health care providers for antibiotic prophylaxis if they are asymptomatic, and for testing and treatment if they are symptomatic. It is very important that any patient for whom the index of suspicion for pertussis is high enough to justify testing remain isolated until the results of the test are known. Please refer to the following guidelines regarding isolation when testing for pertussis:

- Please advise **any** patients you test for pertussis to stay home from work, school, and other activities at least until they know the results of the test.
- If the test results are **positive, the patient will need to stay home until they have finished all 5 days of antibiotics** and are no longer infectious.
- If the test is negative, the patient still needs to finish the antibiotics. **A negative PCR test does not definitively rule out pertussis** therefore your decision regarding whether the patient needs to remain in isolation should be based on their clinical presentation and whether they will be in contact with vulnerable populations (particularly infants), as well as the test results.

Included with this letter are guidelines from the State of Wisconsin concerning testing, treatment and prophylaxis for pertussis. The 2 algorithms and antibiotic dosing information should help you in your clinical decision making. The full, updated guidelines (February, 2012) are available on our Marathon County Health Department website.

Ruth Klee Marx

Ruth Klee Marx, BS, MS
Epidemiologist

Pertussis
(Also known as Whooping Cough)

Section 1:
ABOUT THE DISEASE

A. Etiologic Agent

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

B. Clinical Description

Presentation

The clinical course of a classic pertussis infection is divided into three stages: catarrhal, paroxysmal, and convalescent.

The catarrhal stage is characterized by the insidious onset of symptoms similar to the common cold: runny nose, sneezing, low-grade fever, and a mild occasional cough. The cough gradually becomes more severe and after 1-2 weeks, the paroxysmal stage begins.

The paroxysmal stage is characterized by the patient having bursts (paroxysms) of numerous, rapid coughs, apparently due to difficulty expelling thick mucus from the tracheobronchial tree. At the end of the paroxysm, the patient may breath in strongly which may be accompanied by a characteristic high-pitched whoop. During such an attack, the patient may turn blue (cyanotic). Children and young infants often appear very ill and distressed. Vomiting and exhaustion commonly follow paroxysmal episodes. The person does not appear ill between attacks. Paroxysmal attacks occur more frequently at night. The paroxysmal stage typically lasts 1-6 weeks, but may persist for up to 10 weeks. During the first 1-2 weeks of the paroxysmal stage, the attacks increase in frequency, remain at the same level for 2-3 weeks, and then gradually decrease. Infants aged less than 6 months may not have the strength to have a whoop, but they do have paroxysms of coughing.

The convalescent stage is characterized by gradual recovery. The cough becomes less paroxysm and disappears in 2-3 weeks. However, paroxysms often recur with subsequent respiratory infections for many months after the onset of pertussis.

The clinical presentation of pertussis varies with age, and the diagnosis can be challenging. Disease in infants younger than 6 months of age may be atypical with a short catarrhal stage and gagging, gasping, or apnea as the prominent early manifestations. Whoop may be absent and the convalescent stage may be prolonged. Older children and adults can present with the classic symptoms of pertussis or with an atypical presentation. Among immunized individuals, particularly adolescents and adults, prolonged cough may be the only manifestation of pertussis. However, pertussis can be quite severe in adolescents and adults. Of the cases identified among Wisconsin residents aged 11 years and older in 2010, over 95% reported paroxysms, 50% reported posttussive vomiting, 28% reported whoop, and 34% reported apnea.

Complications

Pertussis is most severe when it occurs during the first 6 months of life, particularly in preterm and underimmunized infants. Complications include primary or secondary bacterial pneumonia, seizures, hypoxic encephalopathy, and death. Most pertussis-related deaths occur in infants, particularly among those aged <4 months. Conditions that may result from the effects of pressure generated by severe coughing include pneumothorax, epistaxis, subconjunctival hemorrhage, subdural hematoma, hernia, rectal prolapse, urinary incontinence, and rib fracture.

Adolescents and adults may also develop complications of pertussis including problems sleeping, urinary incontinence, pneumonia and rib fracture.

Differential Diagnosis

Physicians should include pertussis in their differential diagnosis for patients in all age groups who present with a prolonged cough illness. The differential diagnosis for pertussis often includes infections caused by *Mycoplasma pneumoniae*, *Chlamydia trachomatis*, *Chlamydia pneumoniae*, respiratory syncytial virus (RSV), adenovirus, and other respiratory viruses, other *Bordetella* species (e.g., *B. parapertussis* and *B. holmseii*).

Despite increasing awareness and recognition of pertussis as a disease that affects adolescents and adults, pertussis is often overlooked in the differential diagnosis of cough illness in this population. Also, adolescents and adults often do not seek medical care until several weeks after the onset of their illness. Therefore, in addition to the agents listed above, the differential diagnosis among older age groups may include other causes of chronic cough, such as bronchospasm, gastroesophogeal reflux disease, post viral bronchospasm, sinusitis, and chronic lung disease.

Immunity

Recent evidence suggests that immunity to *B. pertussis* is not life-long. Immunity against pertussis disease wanes after 4 to 20 years and protective immunity following pertussis vaccination wanes after 4 to 12 years.

Routine childhood immunization with pertussis whole-cell pertussis vaccine began in the 1940s. The first acellular pertussis vaccine was licensed in 1991 for use among children aged <7 years. Because of concern about waning immunity, in 2005, a tetanus toxoid, diphtheria toxoid and acellular pertussis vaccine (Tdap) formulated for use among adults and adolescents was licensed in the United States for persons aged 11-64 years. In 2010, the Advisory Committee on Immunization Practices (ACIP) expanded their recommendations for Tdap to include off-label use among underimmunized children aged 7-10 years and adults aged ≥65 years (especially those with infant contact). As of 2011, Tdap remains a one-dose series.

C. Reservoirs

Humans are the only host of *Bordetella pertussis*.

D. Modes of Transmission

B. pertussis is transmitted from person to person by: (1) direct contact with nasopharyngeal secretions of an infected person, or by (2) contact with droplets of nasopharyngeal secretions from an infected person. Droplets are generated during coughing, sneezing, or talking, and during the performance of certain procedures such as bronchoscopy or suctioning. These particles can be propelled through the air for distances of approximately 3 feet.

Examples of direct or droplet contact with nasopharyngeal secretions include a cough or sneeze in the face, sharing food, sharing eating utensils during a meal, kissing, performing a full medical exam including examination of the nose and throat.

E. Incubation Period

The incubation period is usually 7–10 days, with a range of 5–21 days.

F. Period of Communicability or Infectious Period

The period of communicability depends on whether the patient has been treated with appropriate antibiotic therapy (see attachment A for definition of appropriate antibiotic therapy) and the patient's age:

- If not treated with appropriate antibiotic therapy: from 7 days before cough onset to 21 days after cough onset.
- If treated with appropriate antibiotic therapy: from 7 days before cough onset through the fifth day of appropriate antibiotic treatment.
- If untreated, infants aged <1 year with pertussis remain infectious for longer periods (up to 42 days from cough onset).

To determine a pertussis case-patient's infectious period, it is helpful to have a calendar. The critical piece of information that is needed is the day the case-patient began coughing, which is considered day zero. This information is usually obtained during follow-up with the health care provider regarding the patient's course of illness, as well as from the patient.

For example, patient A began coughing on January 15th. To determine the infectious period:

- Count back 7 days from the day of cough onset. This would be January 8th.
- From the cough onset, count forward 21 days. This would be February 5th.

Therefore, the infectious period is from January 8th through February 5th. However, if the individual received appropriate antibiotics within that time period, the infectious period would end after the first five days of full adherence to a course of an appropriate antibiotic.

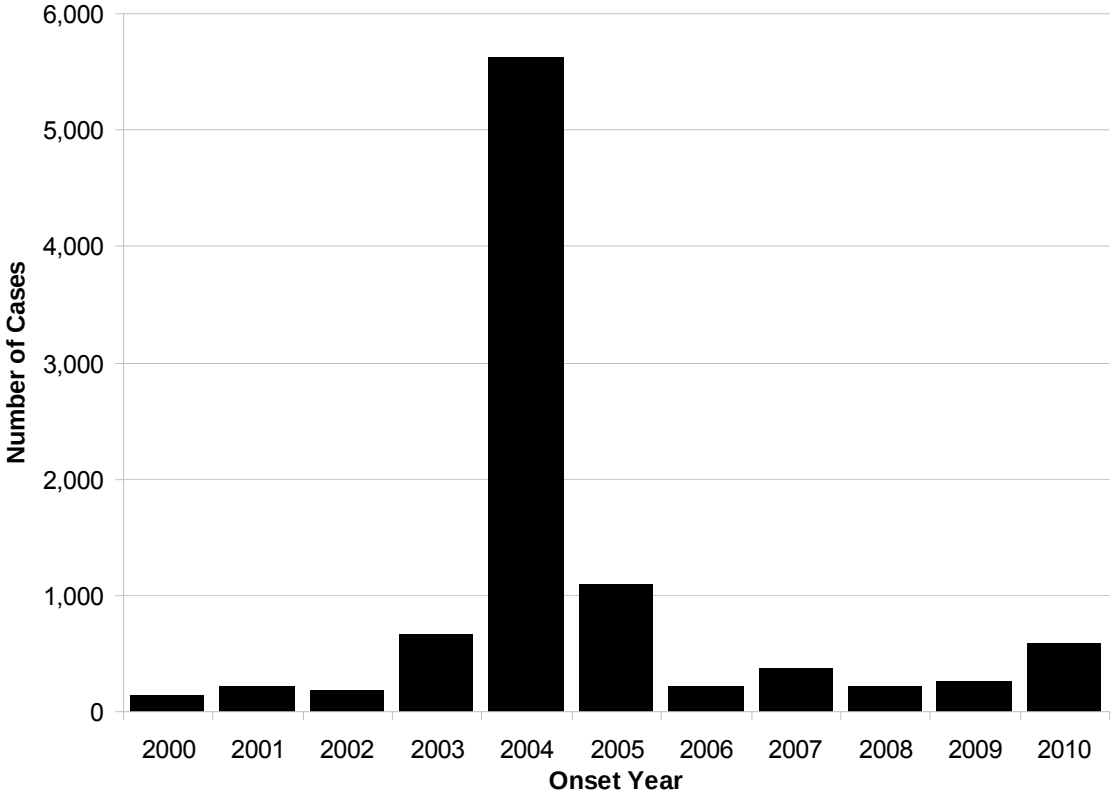
G. Epidemiology

Pertussis occurs worldwide. It is endemic, with peaks of disease incidence occurring every 2–5 years. Pertussis is highly infectious, with secondary attack rates of 80% among non-immune household contacts. A silent carrier state has been identified, but it is infrequent and transient. It has been demonstrated to result in transmission in families, but its importance in maintaining *B. pertussis* in the community is unknown.

Following introduction of pertussis vaccine in the 1940s, pertussis incidence gradually fell in the United States. However, from 1990 to 2004, the incidence of reported pertussis increased among all age groups. Since 2004, the incidence of pertussis has decreased nationwide but continues to remain higher than during the 1990s. Infants aged <6 months, who are at greatest risk for severe disease and death, continue to have the highest reported rate of pertussis with a 60% increase in incidence in Wisconsin observed from 2008 (79.4 cases per 100,000) to 2009 (127 cases per 100,000). While approximately 40% of reported cases in 2009 occurred among adolescents (aged 11–19 years) and adults (aged >=20 years), persons aged 7-10 years have contributed to a growing proportion of cases during the last several years (9% of cases in 2006, 13% of cases in 2007, 23.5% of cases in 2008, and 23% of cases in 2009).

During 2004 and 2005, Wisconsin experienced a large, statewide outbreak of pertussis: 5,629 cases (confirmed and probable) were reported during 2004 (incidence 102.1 per 100,000) and 1,104 cases were reported in 2005 (incidence 19.9 per 100,000). Mirroring the national trends, the incidence of pertussis decreased in Wisconsin during the years following the outbreak (Figure 1).

Figure 1: Number of pertussis cases meeting the surveillance definitions of confirmed or probable, by year of onset, Wisconsin, 2000-2010



During 2010, changes in pertussis surveillance methods resulted in an increased number of reported probable pertussis cases, for an overall total of 585 confirmed and probable cases in 2010 (incidence = 10.4 per 100,000) (see case definitions on pages 22-23). During 2010, 75% of reported cases were among persons aged >5 years. However, the incidence of pertussis was highest among infants aged <1 year (incidence = 90.3 per 100,000). Among affected infants, 20% were not yet eligible for immunization, 23% were under-immunized for their age, and 57% were appropriately immunized for their age.

To prevent pertussis infection among infants, it is particularly important to ensure that infants (and those in contact with infants) receive their immunizations on time, according to the recommended schedule, and that every effort is made to catch up those who are behind in the schedule. In addition, vaccination of adolescents and adults with Tdap is an important prevention measure.

H. Prevention Measures

Routine childhood vaccination with DTaP, adolescent and adult vaccination with the Tdap booster vaccine, and appropriate and timely use of post-exposure antimicrobial prophylaxis are the best preventive measures against pertussis. Good personal hygiene (which consists of proper hand hygiene, disposal of used tissues, and not sharing eating utensils,) is also important.

The ACIP and the Centers for Disease Control and Prevention (CDC) recommend routine vaccination against *B. pertussis* using DTaP (diphtheria, tetanus, acellular pertussis) and Tdap (tetanus, diptheria, acellular pertussis) vaccines. Recommendations for vaccination with DTaP and Tdap vaccine are detailed below. Vaccination is recommended for all individuals who have not already received the appropriate immunizations for their age.

Recommendations for Routine Vaccination with DTaP and Tdap Vaccine

- **Children aged 6 weeks through 6 years** should routinely receive pertussis vaccine as DTaP. The primary series of four doses should be received at 2, 4, 6, and 15-18 months of age. A booster dose should be received at school entry (4-6 years of age).
- **Children aged 7 through 10 years** not fully vaccinated against pertussis (fully vaccinated is defined as five doses of DTaP or four doses of DTaP if the fourth dose was administered on or after the fourth birthday) should receive a single dose of Tdap.
- **Children aged 11-12 years** who have not already received Tdap should routinely receive a booster dose of Tdap vaccine. Tdap vaccine is administered as a one-time booster dose.
- **Adolescents and adults** who have not already received Tdap should be administered a dose of Tdap in place of their next Td booster or whenever vaccination with Tdap is indicated.
- **Adolescents and adults who have or anticipate having contact with an infant** aged less than 1 year should receive a dose of Tdap as soon as feasible if they have not previously received Tdap and regardless of time since last Td dose.
- **Women who might become pregnant** should receive a single dose of Tdap if they have not already received a dose and regardless of time since last dose of Td. Women who have not received Tdap (including women who are breastfeeding) should receive a dose during the immediate postpartum period, before discharge from the hospital or birthing center.
- **Health care personnel** regardless of age should receive a dose of Tdap as soon as feasible if they have not previously received Tdap and regardless of time since last Td dose.

For more information on DTaP or Tdap vaccination please access:

- The most current version of the Advisory Committee on Immunization Practices (ACIP) statement on DTaP or Tdap, see citations listed in the References section.
- Frequently asked questions about pertussis vaccination, see: http://www.cdc.gov/vaccines/vpd-vac/pertussis/default.htm.
- DTaP and Tdap Vaccine Information Statements (VIS), see: http://www.cdc.gov/vaccines/pubs/vis/.

A Pertussis Public Health Fact Sheet for the general public can be obtained from the WDPH website at: http://www.dhs.wisconsin.gov/immunization/pertussis.htm.

Section 2:
REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Wisconsin Division of Public Health (WDPH)

Report any of the following:

- An individual with a suspected case of pertussis, as diagnosed by a health care provider;
- Isolation, by culture, of *B. pertussis* from a clinical specimen;
- A positive polymerase chain reaction (PCR) test result for *B. pertussis* nucleic acid;
- Cough illness in a contact of a laboratory-confirmed case of pertussis.

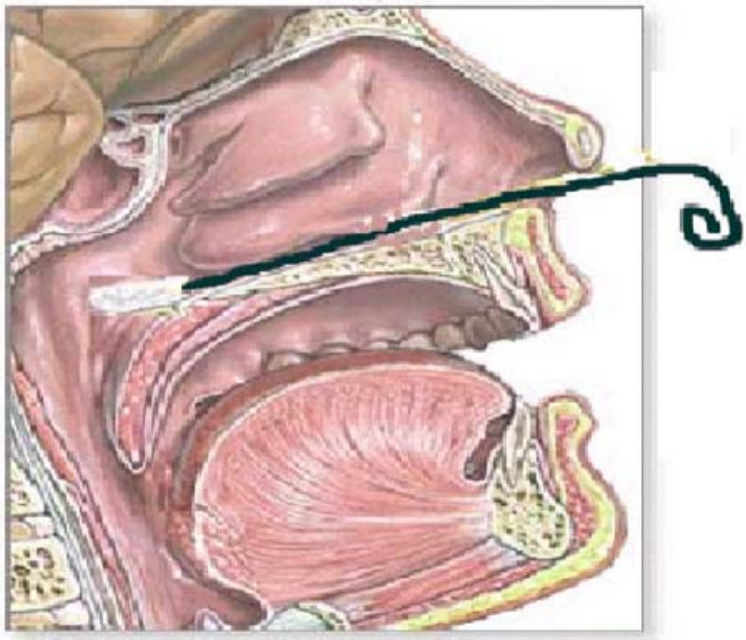
Note: See Sections 3B and 3C for information on how to report a case.

B. Specimen Collection and Laboratory Testing

Nasopharyngeal (NP) Swab collection for testing:

- Nasopharyngeal (NP) Swabs are the preferred specimen for pertussis testing and should be collected as soon as pertussis is suspected (preferably within 21 days of cough onset) for the best chance of detection of the bacteria.
    - A diagram of NP specimen collection is shown in Figure 1. When collecting specimens, gently insert the swab into one nare and proceed gently to the posterior wall of the pharynx (see diagram below). Do not direct the swab upward; let it creep along the floor of the nasal cavity. Also, slightly bending the wire swab into an arc shape may allow for easier insertion into the pharynx. Do not force the swab past obstruction; try the other nare if resistance is encountered. Hold the swab in place for up to 10 seconds, or until a paroxysmal cough is elicited (or ask the patient to cough). This should ensure an adequate specimen and reduce the possibility of false negative results. Repeat with a second swab. Some practitioners have found it easier to insert both swabs at the same time, which is acceptable. After removing the swabs from the nares, place one Dacron swab into the Regan-Lowe transport tube for culture testing and cap tightly. Place the other Dacron swab into the dry, sterile transport tube for PCR testing and cap tightly. Write the patient name and the date and time of collection on each tube. Visit the following link for a demonstration of how to collect a specimen: http://www.cdc.gov/pertussis/clinical/diagnostic-testing/specimen-collection.html.

Figure 1. A sterile swab is passed through the nostril and into the nasopharynx.



Tests that should be ordered:

- If possible, NP swabs should be collected for testing with both polymerase chain reaction (PCR) and culture. However, if only one specimen can be collected, it should be sent for PCR testing.
- Culture: Isolation of *B. pertussis* remains the gold standard for pertussis testing; however, the sensitivity of culture is low and the time needed to obtain results may be long (days to as long as 2 weeks). The efficacy of culture in detecting *B. pertussis* is greatest during the catarrhal phase and first 14 days following cough onset. Receipt of antibiotics effective against *B. pertussis* decreases the likelihood of isolating *B. pertussis* in culture. Accordingly, if more than 14 days have elapsed

since cough onset or the patient has received antibiotics effective against *B. pertussis*, testing with culture is not recommended.

- PCR is a valuable tool for the detection of *B. pertussis* because the test is substantially more sensitive than culture and results are available more rapidly. PCR is most reliable during the catarrhal phase and within the first 21 days after onset of cough and before initiation of appropriate antibiotic treatment. However, a positive PCR test result is not dependent upon the presence of living organisms; thus, the impact of antibiotic treatment on the test result is less with PCR than with culture.
- *Note*: Direct fluorescent antibody (DFA) and serologic tests are currently not acceptable forms of laboratory confirmation of pertussis infection and therefore are not recommended.

Sending specimens for testing

- If the patient is suspected of having pertussis, the specimens should be sent to the Wisconsin State Laboratory of Hygiene (WSLH) or a commercial laboratory that performs pertussis PCR (and culture, if possible) testing.
    - Contact your local health department for details on fee-exempt testing (http://www.dhs.wisconsin.gov/localhealth/counties/countyalphalist.htm).
- If serum specimens were collected for immune status testing only, they should be sent to a commercial laboratory.

Submission of Specimens for Testing at WSLH

The WSLH offers both PCR and culture testing. Request kit #30 and the accompanying form "CDD Requisition Form (A)" from the WSLH by calling (800) 862-1088 or (608) 265-2966. If you have questions about the testing process or specimen collection, please contact the WSLH Customer Service at (800) 862-1013.

Tests offered include:

- *Bordetella pertussis/parapertussis* PCR Test code 3224
- *Bordetella* Culture Test code 623C

Kit #30 contains, among other things, 2 Dacron/polyester nasopharyngeal swabs, WSLH Regan-Lowe culture (charcoal transport) medium, and sterile tube for transport of the PCR test portion. The swab applicators use a flexible wire, which is the only device that should be inserted into the nasopharynx for the collection of the specimen. Wrap absorbent material around each tube. Place the transport tubes in the pressure bag provided and seal. If submitting a PCR specimen, you must also place a frozen cold-pack into the Styrofoam mailer. If specimens are not shipped immediately, they should be kept at room temperature or incubated at 35°C (95°F). Optimally, the WSLH would like to receive the specimen for culture within 24 hours of collection. The dry swab specimen for PCR is relatively stable and therefore time is less critical.

As of January 9, 2012 WSLH uses a Bordetella PCR test developed at the CDC and validated at WSLH. Unlike the previous *Bordetella pertussis*/*parapertussis* PCR test, the new test is able to differentiate *B. holmesii* from *B. pertussis* and *B. parapertussis*. *B. holmesii* has been detected rarely in respiratory specimens from patients with pertussis-like symptoms. Its role in respiratory illness is not well defined at this time. Being able to differentiate *B. holmesii* from *B. pertussis* and *B. parapertussis* will be valuable in managing patients and averting unnecessary public health measures. At this time, no public health follow up is needed for individuals who test positive for *B. holmesii.*

The PCR is a real-time multiplex test that has primer/probe sets that detect insertion sequences for *B. pertussis* (IS481), *B. parapertussis* (pIS1001) and *B. holmesii* (hIS1001). A separate PCR reaction is performed to detect the pertussis toxin gene on specimens positive for *B. pertussis* or *B. holmesii*. Positive and negative results are reported for each *B. holmesii*, *B. pertussis*, and *B. parapertussis*.

Negative results do not rule out Bordetella infection because of the following:

- The amount of bacteria in the nasopharynx at the time of sample collection may have been too low to be detected.
- Inadequate specimen collection, processing, shipping or storage can significantly reduce the likelihood of detecting *B. pertussis*.
- The full clinical and epidemiologic picture must be taken into consideration when interpreting test results.

Section 3:
REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify sources of infection, sites of transmission, and additional cases.
- To identify exposed persons to assure timely administration of appropriate antimicrobial prophylaxis, and to prevent further spread of infection.
- To monitor the effectiveness of outbreak control strategies.
- To monitor the effectiveness of the DTaP and Tdap vaccines.

B. Laboratory and Health Care Provider Reporting Requirements

Pertussis is a Category I Reportable Disease according to WDPH regulations (DHS 145.04). Health care providers should immediately report to the local health department (LHD), by telephone, all suspected cases of pertussis, as defined by the reporting criteria in Section 2A. Within 24 hours, health care providers should submit a case report online through the Wisconsin Electronic Disease Surveillance System (WEDSS) or by fax using an Acute and Communicable Disease Case Report (F44151).

Laboratories testing specimens from Wisconsin residents that yield evidence of pertussis infection should report the case to the LHD online through WEDSS or by fax using an Acute and Communicable Disease Case Report (F44151).

LHD contact information can be found at:
http://www.dhs.wisconsin.gov/localhealth/counties/countyalphalist.htm.

C. Local Health Department (LHD) Reporting and Follow-Up Responsibilities

Reporting Requirements

Each LHD must report any suspected case of pertussis, as defined by the reporting criteria in Section 2A, to both of the following entities:

- WDPH Regional Immunization Representatives immediately by phone (http://www.dhs.wisconsin.gov/immunization/regiondepts.htm).
- WDPH, using the pertussis case report form in WEDSS.

Case Investigation

Below are questions that the LHDs should ask the health care provider and patient at the start of the case investigation. The LHD should also gather all information necessary to complete the WEDSS case report form.

To assess the likelihood that a suspect case is a true case prior to laboratory testing, the LHD should ask about:

1. Clinical presentation, including date of onset of symptoms, particularly cough, paroxysmal cough, whoop, posttussive vomiting, apnea, duration of cough, and complications (e.g., pneumonia, hospitalization);

2. Pertussis immunization history;

3. Whether there was any recent contact with anyone with similar symptoms;

4. Possible transmission setting (e.g., childcare, school, health care setting); and

5. Laboratory testing information, including PCR and culture results.

Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LHD to understand and institute the control guidelines listed in Section 4.

Section 4:
CONTROLLING FURTHER SPREAD

This section provides detailed control guidelines regarding how to control disease in a case-patient and protect contacts of a case-patient from becoming infected. The LHD will take the lead on implementing control measures.

A. Control of Disease in a Case

The most important pieces of information that are needed to make appropriate recommendations are: (1) the date of cough onset; and (2) if/when appropriate antibiotics were taken. This information helps to determine the case-patient's infectious period (see Section 1F for assistance with calculations).

Algorithm I (Appendix B) provides a guideline for how persons suspected of having pertussis should be managed in a non-outbreak setting. If there is an ongoing outbreak of pertussis or the health care provider has a high index of suspicion of pertussis, then the health care provider should test, treat, and isolate the patient.

1. Implement control measures before laboratory confirmation. If the laboratory results are negative, the decision to continue control measures should be made in consultation with the treating physician and the LHD.

2. Exclude, isolate, and treat the case-patient according to how long the patient has been coughing:

    a. If the case-patient has been coughing ≤21 days:

        i. Treatment: Appropriate antibiotic treatment is required regardless of immunization status. (Refer to Appendix A: Recommended Antibiotic Treatment and Prophylaxis of Pertussis, at the end of this chapter, for further details)

        ii. Exclusion: Isolate and exclude from public activities, school, and the workplace through the first 5 days of the full course of antibiotics, or through 21 days from the onset of cough for those who do not receive appropriate treatment.

    b. If the case-patient has been coughing >21 days:

i. Treatment: Antibiotic treatment is **not** recommended, because the case-patient is already beyond his/her infectious period and initiating treatment more than 21 days after onset of cough is unlikely to be beneficial. However, below are situations in which treatment is recommended >21 days after cough onset:

(1) Treatment should be initiated within 42 days (6 weeks) of cough onset in infants aged <1 year.

(2) Treatment should be initiated in any coughing individual who is culture positive, regardless of time since cough onset.

ii. Exclusion: If the patient has been coughing for more than 21 days, exclusion and isolation is not necessary unless the patient is an infant. If the patient is an infant, he/she should be excluded until 42 days after cough onset or until 5 days after initiation of treatment with an appropriate antibiotic.

3. Gather information from the case-patient about possible sources of his/her infection, such as contact with an individual with a known or suspected case of pertussis or prolonged cough illness.

4. Investigate by asking the case-patient other questions as outlined in Section 3C.

5. Complete routine pertussis vaccination series, if indicated, after the patient recovers from his/her illness.

   Note: ACIP recommends that a child who has had culture-proven pertussis does not need additional doses of pertussis vaccine (the series may be completed with pediatric DT). However, if the diagnosis was made without a culture, the pertussis vaccine series should be completed on schedule. ACIP also recommends that adolescents and adults with a history of pertussis generally should receive a single dose of Tdap according to the regular vaccination schedule because the duration of immunity after natural infection is unknown and because the diagnosis of pertussis can be difficult to confirm, particularly with tests other than culture for *B. pertussis*. Administering pertussis vaccine to persons with a history of pertussis presents no theoretical safety concern.

B. Protection of Contacts of a Case

Algorithm II (Appendix C) provides a guideline for how close contacts of pertussis case-patients should be managed.

1. Define the dates during which the case-patient was infectious, using the standard pertussis infectious period described in Section 1F.

2. Identify all individuals who were exposed to (had close contact with) the case-patient during the case-patient's infectious period. *Note*: The definition of those considered exposed (i.e., close contacts) is narrow to decrease the number of times individuals may need to take multiple courses of antibiotics, which can be associated with serious side effects and may promote the development of antibiotic resistance. Pay particular attention to contacts that are at high-risk for severe pertussis disease (e.g., infants, particularly those <6 months of age, or immunocompromised individuals) or contacts who could transmit pertussis to those at high risk. (See next steps below for guidance on identification of "high-risk" and "transmission-risk" contacts.)

   a. Definition of close contact: Specific definitions of a contact will vary according to the situation. Transmission can be expected with:

   i. Direct face-to-face contact for a period (duration not defined) with a case-patient who is symptomatic (e.g., in the catarrhal or paroxysmal phase of illness).

ii. Shared confined space in close proximity for a prolonged period of time, such as ≥1 hour, with a symptomatic case-patient. (Example: Routine car pool, shared office, shared household, kindergarten and special needs classes …)

iii. 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 full medical exam including examination of the nose and throat). Note: Droplet precautions apply only if the suspected exposure occurred within a 3-ft radius.

iv. Contact in a setting with known pertussis transmission: e.g., two or more cases in the same classroom or sports team, students working closely together, bus mates or carpool contacts, or other similar extensive interactions.

v. Examples of close contacts may include:

- Those living in the same household
- Contact in group settings where close interactions occur (e.g., after-school care groups, playgroups, core group of close friends, lunch partners, classmates who sit in "pods" or very close seating arrangements, carpool, or teammates)
- Boyfriend/girlfriend
- Classmates and caregivers in a childcare setting; or
- Individuals in a special needs program classroom

See Section 4C for more information on the definition of a close contact in health care settings.

3. Identify and manage all individuals who are at high risk for severe disease and adverse outcomes.

a. High-risk contacts include:

i. Infants <1 year of age (particularly those <6 months of age);

ii. Immunocompromised individuals;

iii. Individuals with chronic lung disease (including asthma and cystic fibrosis);

iv. Individuals with neuromuscular disorders that prevent or reduce the ability to clear secretions; or

v. Unimmunized or underimmunized children.

b. Refer high-risk contacts to their health care provider for evaluation and antibiotic prophylaxis.

4. Identify and manage transmission-risk contacts. Transmission-risk contacts are defined as those who may transmit the disease to persons at high risk for severe disease and adverse outcomes (as defined above).

a. Transmission-risk contacts include:

i. Household members and other close contacts in a household setting where there is a high-risk individual.

ii. Pregnant women in their 3rd trimester (because of concern about transmission to their newborn).

iii. Those attending or working in childcare settings (i.e., same room) if there are infants or a pregnant woman who is in her 3rd trimester or other high-risk individuals in the setting.

iv. Health care workers providing direct patient care, particularly in high risk settings such as NICU, obstetrics, labor and delivery, or bone marrow transplant unit.

b. Ensure transmission risk contacts are carefully evaluated for signs and symptoms and placed on antibiotics, within the proper timeframe, to prevent disease and further transmission.

5. Identify all close contacts with signs or symptoms suggestive of pertussis. Questions to ask include:

a. Do you have cold-like symptoms (e.g., runny nose, sneezing); when did they start?

b. Do you have a cough; when did it start?

c. Describe your cough.

Note: Ask open-ended question first then proceed to the following.

d. When you are coughing, do you feel as if you are choking and cannot breathe?

e. Do you cough at night or is coughing worse at night?

f. Has your cough disturbed your sleep?

g. Do you have coughing spells where you feel as if you cannot breathe?

h. Do you vomit or almost vomit after coughing?

i. Are there other people in your house (or class, team, extracurricular group, worksite, close friends, etc.) with a cough? [Obtain a list of these individuals.]

j. How long have they been coughing?

k. What is their cough like?

l. Where do they work/attend school/etc.?

6. Manage close contacts based on: (1) whether the contact has symptoms; (2) how long the contact has been coughing; and (3) the time since the contact was exposed to the case-patient (while the case-patient was infectious).

a. Manage <u>symptomatic close contacts</u> as suspect cases of pertussis.

i. If contacts have been coughing ≤21 days:

(1) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing, as appropriate for age and cough duration (see Section 2B for more information).

(2) Treatment/prophylaxis: Begin on presumptive antibiotic treatment (refer to Appendix A for further details). Treatment is recommended regardless of immunization status.

(3) Exclusion: Exclusion is the same as for a case-patient: exclude from public activities, school, and the workplace through the first 5 days of appropriate antibiotic treatment, or 21 days from the onset of cough for those who do not receive appropriate antibiotic treatment.

ii. If contacts have been coughing >21 days:

(1) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing, as appropriate for age and cough duration (see Section 2B for more information).

(2) Treatment/prophylaxis: Antibiotic treatment is **not** recommended, as contacts are already beyond their infectious period, which ends 21 days after cough onset. Initiating treatment >21 days after onset of cough is unlikely to be beneficial. However, there are situations in which treatment is recommended >21 days after cough onset:

(a) Treatment should be initiated within 42 days (6 weeks) of cough onset in infants aged <1 year.

(b) Treatment should be initiated in any coughing individual who is culture positive, regardless of time since cough onset.

Note: Please refer to Appendix A for further details.

(c) Exclusion: No exclusion is required, except in the following scenario: the patient is an infant aged <1 year and has been coughing for ≤42 days and has not taken antibiotics..

7. Manage asymptomatic close contacts using the following steps. Educate them about the signs and symptoms of pertussis and advise them to seek medical evaluation and testing, should symptoms develop.

a. If last exposure occurred ≤21 days ago:

i. Diagnostic evaluation: No medical evaluation is needed, unless contact develops symptoms.

ii. Prophylaxis: Recommend antibiotic prophylaxis regardless of immunization status. Refer to Attachment A at the end of this chapter, for further details.

iii. Exclusion: No exclusion is required, even if antibiotics are not taken, except for some transmission-risk contacts, which include:

(1) Health care workers—see Section 4C for further details.

(2) Individuals in a childcare setting where there is contact with infants <1 year of age— see Section 4C for further details.

b. If last exposure occurred >21 days ago:

i. Diagnostic evaluation: No medical evaluation is needed, unless contact develops symptoms.

ii. Prophylaxis: Antibiotic prophylaxis is not recommended, as initiating prophylaxis >21 days after exposure is unlikely to be beneficial. However, prophylaxis should be considered for infants aged <1 year (particularly those <6 months of age with <3 doses of DTaP).

iii. Exclusion: No exclusion is required, even for infants aged <1 year.

8. Review immunization status of close contacts to determine if doses of DTaP or Tdap are indicated.

a. Contacts who are <7 years of age: Contacts who are unimmunized or have received <5 doses of DTaP should, in addition to receiving antibiotic prophylaxis (if recommended), have pertussis

immunization initiated or continued as soon as possible after exposure, according to the following guidelines:

i. Give 1st dose of DTaP at ≥6 weeks of age; doses one, two, and three must be separated by at least four weeks.

ii. Children who have received their third dose of DTaP ≥6 months before exposure should receive a fourth dose at this time.

iii. Children who have received four doses of DTaP should receive a booster of DTaP, unless a dose has been given within the last 3 years.

b. Contacts 7–9 years of age: Contacts who are not fully vaccinated against pertussis (defined as five doses of DTaP or four doses of DTaP if the fourth dose was administered on or after the fourth birthday) should receive a single dose of Tdap.

c. Contacts 10–64 and ≥65 years of age: Contacts in this age group, especially those who have or anticipate having contact with children aged <1 year, who have not previously received a dose of Tdap should receive a single dose of Tdap

d. Immunize against pertussis even if the patient has a history of pertussis disease.

Note: ACIP recommends that a child who has had culture-proven pertussis does not need additional doses of pertussis vaccine (the series may be completed with pediatric DT). However, if the diagnosis was made without a culture, the pertussis vaccine series should be completed on schedule. ACIP also recommends that adolescents and adults with a history of pertussis generally should receive a single dose of Tdap according to the regular vaccination schedule because the duration of immunity after natural infection is unknown and because the diagnosis of pertussis can be difficult to confirm, particularly with tests other than culture for *B. pertussis*. Administering pertussis vaccine to persons with a history of pertussis presents no theoretical safety concern.

9. Notify close contacts of their exposure and the recommendations by telephone or in writing. If there are multiple cases during a short period of time, a general notification letter may be sent to a wider group within the facility or institution. Contact WDPH Immunization Program for templates of notification letters. You may also want to enclose a Pertussis Fact Sheet which can be found on the WDPH website (see Section 1H).

10. Conduct active surveillance in institutional settings (e.g., schools, hospitals) for cough illness, and refer suspect cases for medical evaluation, diagnostic testing, and antibiotic prophylaxis. In health care settings, surveillance should be initiated immediately after identification of a suspect case. Surveillance should continue through 2 incubation periods (42 days) after the date of cough onset in the last case. Please refer to Section 4C for specific recommendations for implementing active surveillance in institutions.

C. Management of Special Situations: Schools, Childcare Centers, and Health Care Settings

Special Guidance for Schools

Please follow the steps for management of a case-patient and his/her contacts presented earlier in this document, in conjunction with the school-specific guidance below.

Identification of Close Contacts

Work with the school nurse or other school personnel (such as teachers and sports team coaches) to identify close contacts. See Section 4B for further guidance.

Identification of High-Risk and Transmission-Risk Contacts

Pay particular attention to identifying any exposed individuals who are at higher risk of developing complications from pertussis as well as to those who could transmit the disease to high-risk contacts.

Identification of Symptomatic Close Contacts

1. Notify teachers or coaches who have had a case in their class or on their sports team to promptly refer other coughing children to the nurse's office for evaluation.

2. Determine if there are any teachers who are close contacts (including student teachers) or staff who have been coughing.

3. Refer symptomatic close contacts among students, teachers, or other staff for medical evaluation and diagnostic testing. *(Note: Testing every suspect case is not necessary when there is a recognized and well-documented, culture-confirmed outbreak in progress.)*

Management of Close Contacts

1. Please see Section 4B for guidance, with the following exceptions for treatment/prophylaxis:

    a. Asymptomatic contacts should be educated about the signs and symptoms of pertussis and should be advised to seek medical evaluation and testing, if symptoms develop.

    b. Treatment/prophylaxis: In general, prophylaxis of all classmates is **not** indicated in a classroom or similar setting (where a group of individuals spend at least 5 days/week together) where there is only one confirmed case. In the school setting, prophylaxis should be limited to those considered to be close contacts, as defined in Section 4B.

        i. Situations where prophylaxis may be indicated are:

            (1) Individuals within the group may receive prophylaxis if they fit the definition of a close contact (e.g., boyfriend or girlfriend of the case-patient, on the same sports team, shared food or drink), or are considered a high-risk contact (e.g., pregnant woman in her 3rd trimester), or are considered a transmission-risk contact (e.g., a member of a household who is considered at risk for developing severe pertussis).

            (2) In some instances, such as a classroom for special needs students or childcare or where there are significant numbers of high-risk contacts, it may be appropriate to provide prophylaxis to the whole group, unless >21 days have passed since cough onset in the last symptomatic person or the case-patient was not present during his/her infectious period.

        iii. The extent to which prophylaxis is recommended will vary according to the extent of exposure, the presence/absence of other coughing students, whether any other cases of pertussis have been reported in the area, and whether high-risk individuals are present.

        iv. For contacts in classrooms and other groups in which there is >1 confirmed case, it may be appropriate to provide prophylaxis to the entire group, unless >21 days have passed since cough onset in the last symptomatic person or the case-patients were not present during their infectious periods. The extent to which this recommendation is applied will vary according to the extent of exposure, the presence/absence of other coughing students, whether there is any other reported pertussis in the area, and whether high-risk individuals are present.

        v. For childcare settings, see below for more specific guidance.

Notification

Send letters of notification to close contacts. If there are multiple cases occurring during a short period of time, a general notification letter may be sent to a wider group within the facility or institution. Contact WDPH Immunization Program for example of template notification letters. A Pertussis Fact Sheet is available on the WDPH pertussis website, see section 1H above. Educational materials should include information about the signs and symptoms of pertussis, and close contacts should be advised to seek medical evaluation and testing, if symptoms develop.

If resources allow, it is helpful to telephone the contacts, especially the symptomatic ones, as well as send letters home. The school nurse may be able to make some or all of these calls.

Conduct Active Surveillance

Continue initial surveillance efforts for two incubation periods (42 days) after the date of cough onset in the most recent case, as outlined in Section 4B.

Special Guidance for Childcare Centers

The main focus in a childcare setting is preventing the transmission of pertussis to infants, particularly infants aged <6 months (and other high-risk individuals). Therefore, keep the following in mind:

- Carefully evaluate the situation regarding staff who may work in several different classrooms throughout the day or week and have had contact with the case-patient and with infants. Entire classrooms in the childcare setting (including the classroom staff) are considered close contacts and should receive antibiotic prophylaxis, if indicated.

- Remember that treatment should be initiated within 42 days (6 weeks) of cough onset in infants aged <1 year.

- Prophylaxis should be considered for contacts of a case-patient who are infants aged <1 years (particularly those <6 months of age, with <3 doses of DTaP).

Please follow the steps for management of a case and contacts outlined in Section 4B, in conjunction with the childcare-specific guidance below.

Identification of Close Contacts

Identify close contacts (including teachers and staff) by using the information in Section 4B. Unlike the classroom setting with school-aged children, all children and staff in the classroom in a childcare setting are considered close contacts because of the nature of interaction between children (e.g., less than optimal cough etiquette, hand hygiene, and sharing/mouthing of toys in this age group).

Identification of High-Risk Individuals

Because of the age, immunization status, and other risk factors of many childcare attendees, make a special effort to identify exposed individuals and groups who are at higher risk of developing complications from pertussis or those who could transmit the disease to high-risk contacts. These individuals should be referred to their providers, regardless of whether they have symptoms.

Identification of Symptomatic Close Contacts

In addition to the recommendations in Section 4B, ask about possible cases occurring among attendees or employees within the previous four weeks. In settings involving infants, all potential cases should be investigated, and necessary measures should be taken to stop further spread. Treatment should be initiated within 42 days (6 weeks) of cough onset in symptomatic infants aged <1 year. However, there is no need to

exclude individuals in this group if it has been at least 21 days since cough onset (regardless of antibiotic compliance). Additionally, treatment should be initiated in any coughing individual who is culture positive, regardless of time since cough onset.

Management of Close Contacts

Depending on the presence or absence of symptoms in the contact, the duration of cough and the time since last exposure, manage the contacts as described in Section 4B. The exceptions from these recommendations are as follows:

1. Asymptomatic close contacts who attend/work in a setting where there are infants in the same room:
    a. If last exposure has occurred ≤21 days ago:
        i. Diagnostic evaluation: No medical evaluation is needed.
        ii. Treatment/prophylaxis: Antibiotic prophylaxis is required.
        iii. Exclusion: No exclusion is required, unless appropriate antibiotics are not taken; then exclusion is for 21 days from time of last exposure to the infectious case.
    b. If last exposure occurred >21 days ago:
        i. Diagnostic evaluation: No medical evaluation is needed.
        ii. Prophylaxis: No antibiotic prophylaxis is required. However, prophylaxis should be considered for infants aged <1 year (particularly those <6 months of age, with <3 doses of DTaP).
        iii. Exclusion: No exclusion is required, even for infants aged <1 year, even if they haven't received antibiotics in the 22–42 days after exposure.
2. Additionally, all asymptomatic contacts should be educated about the signs and symptoms of pertussis and should be advised to seek medical evaluation and testing, should symptoms develop.

Notification

Send letters of notification to parents and staff. If there are multiple cases over a short period of time, a general notification letter may be sent to a wider group within the facility or institution. A Pertussis Fact Sheet can be found on the WDPH website, see Section 1H.

If feasible, it is helpful to telephone the contacts, especially the symptomatic ones, as well as sending the letters home. The affected institution usually makes these calls.

Conduct Active Surveillance

Continue initial surveillance efforts for two incubation periods (42 days) after the date of cough onset in the last case, as outlined in Section 4B.

Special Guidance for Health Care Settings

Because of the potential for transmission to individuals at high risk of complications from pertussis, exposure criteria and control measures in health care settings are more rigorous than in other settings. If there is a high index of suspicion of pertussis among health care personnel (regardless of whether there is an epidemiologic link to a confirmed case), the individual should receive medical evaluation, appropriate

diagnostic testing, and be assessed for antibiotic treatment (see next paragraph). The individual should also be excluded from the workplace through the first 5 days of treatment with an appropriate antibiotic.

Recent ACIP guidance recommends post exposure antimicrobial prophylaxis for all health care personnel who have unprotected exposure to pertussis and are likely to expose a patient at risk for severe pertussis (e.g., hospitalized neonates and pregnant women). Other health care personnel should either (a) receive post exposure antimicrobial prophylaxis or (b) be monitored daily for 21 days after pertussis exposure and treated at the time of onset of signs and symptoms of pertussis (and be excluded through day 5 of a regimen of appropriate antibiotics if they become symptomatic).

Please follow the steps for management of a case patients and contacts outlined in Section 4B, in conjunction with the health care-setting-specific guidance below.

Control Measures for Case-Patients

1. The case-patient is a patient in the health care setting: For patients (both inpatient and outpatient) who have a case of pertussis, see Section 4A for recommendations on assessment, treatment/prophylaxis, and exclusion. Additional guidance includes the following:

    a. In the inpatient setting:

        i. If it has been ≤21 days from the patient's cough onset, isolate the inpatient with confirmed or suspect pertussis. The patient should be placed on droplet precautions until completion of 5 days of treatment with an appropriate antibiotic.

        ii. If it has been >21 days since the patient's cough onset, isolation is not required.

    b. In the outpatient setting:

        i. Restrict the case-patient from public activities during the first 5 days of appropriate antibiotic therapy.

        ii. In general, individuals who were in waiting rooms or other care areas at the same time as a pertussis case-patient should not be considered close contacts.

2. The case-patient is health care personnel: For health care personnel who are confirmed cases, see Section 4A for recommendations on assessment, treatment/prophylaxis, and exclusion. The only caveat is that in some high-risk settings (e.g., where there is on-going contact with infants), treatment and/or exclusion may be required within 42 days after cough onset.

Control Measures for Close Contacts

1. Identify close contacts. In health care settings, the definition of "close contact" is more rigorous and includes the following:

    a. Having face-to-face contact within 3 feet of the case-patient without wearing a surgical mask or other protection of the face and respiratory tract; this includes performing a medical examination, obtaining a NP swab specimen, suctioning, intubating or performing bronchoscopy or a similar procedure without wearing a mask.

    b. Conducting any procedure that induces coughing of the case-patient, even if farther from the case-patient than 3 feet, without wearing a surgical mask or other protection of the face and respiratory tract.

c. Coming into direct mucosal contact with respiratory, oral or nasal secretions of the case-patient or via fomites.

d. Sharing a room with the case-patient; the degree of contact and risk of infection in such situations should be evaluated on a case-by-case basis.

e. Having any other close contact with a case-patient, as defined in Section 4B.

2. *Please note: If a surgical mask was worn by the case-patient and/or the contact during the entire exam, including specimen collection, there is no need for prophylaxis of the contact. However, this guidance is only for assessing exposures that have already taken place and does not allow a health care provider who is infectious with pertussis to continue working, even if wearing a mask.*

3. Identify symptomatic close contacts. See Section 4B, and please note the following:

   a. Ask about possible cases among employees within the previous 4 weeks.

   b. All potential cases should be investigated, and necessary measures should be taken to stop further spread.

4. Manage close contacts based on whether the contact is a patient in the health care setting or a member of the health care staff and whether the contact individual is symptomatic or asymptomatic.

   a. **Contact is a patient**: For patients (both inpatient and outpatient) who are identified as close contacts in the health care setting, see Section 4B for recommendations on assessment, treatment/prophylaxis, and exclusion. Additionally, please follow the isolation and quarantine requirements listed below:

      i. *If Symptomatic*

         (1) If coughing ≤21 days:

            (a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing, appropriate for cough duration. (See Section 2B for more information.)

            (b) Treatment/prophylaxis: Begin on empiric antibiotic treatment (refer to Appendix A at the end of this chapter, for further details).

            (c) Exclusion/isolation:

               (i) Inpatient: Isolate patient and place on droplet precautions until completion of the first 5 days of antibiotic therapy

               (ii) Outpatient: Restrict from public activities until completion of the first 5 days of antibiotic therapy.

         (2) If coughing >21 days:

            (a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing, appropriate for cough duration. (See Section 2B for more information.)

            (b) Treatment/prophylaxis: Antibiotic prophylaxis is not needed, as initiating treatment >21 days after onset of cough is unlikely to be beneficial. However, there are situations in which treatment is recommended >21 days after cough onset:

(i) Treatment should be initiated within 42 days (6 weeks) of cough onset in infants aged <1 year.

(ii) Treatment should be initiated in any coughing individual who is culture positive, regardless of time since cough onset. Please refer to Appendix A for further details.

(c) Exclusion/isolation:

(i) Inpatient: Isolation is not required.

(ii) Outpatient: No exclusion is required.

ii. *If Asymptomatic*: All asymptomatic contacts should be educated about the signs and symptoms of pertussis and should be advised to seek medical evaluation and testing if symptoms develop.

(1) If last exposure occurred ≤21 days ago:

(a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing only if contact develops symptoms suggestive of pertussis. (See Section 2B for more information.)

(b) Prophylaxis: Antibiotic prophylaxis is recommended. Refer to Attachment A at the end of this manual for further information regarding antibiotics.

(c) Exclusion/isolation:

(i) Inpatient: No isolation is required, unless appropriate antibiotics are not taken; then isolation is for 21 days from last exposure to the infectious case.

(ii) Outpatient: No exclusion is required, even if antibiotics are not taken, except for some transmission-risk contacts, which include health care personnel and individuals working in a childcare setting where there is contact with infants.

(2) If last exposure occurred >21 days ago:

(a) Diagnostic evaluation: None needed.

(b) Prophylaxis: Antibiotic prophylaxis is not needed, as initiating prophylaxis >21 days after onset of cough is unlikely to be beneficial. However, prophylaxis should be considered for infants aged <1 year (particularly those <6 months of age, with <3 doses of DTaP).

(c) Exclusion/isolation:

(i) Inpatient: No isolation is required.

(ii) Outpatient: No exclusion is required.

b. **Contact is health care personnel**: Management of health care personnel who are close contacts of a confirmed case is more stringent than for the general public. Based on the presence or absence of symptoms in the contact, the duration of cough, and the time since last exposure, manage these contacts as follows:

i. *Symptomatic Health Care Personnel*

(1) If coughing ≤21 days:

(a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing, appropriate for cough duration. (See Section 2B for more information.)

(b) Treatment/Prophylaxis: Begin on empiric antibiotic treatment (refer to Appendix A at the end of this document, for further details).

(c) Exclusion: Exclusion is the same as for a case. Exclude from public activities, school, and the workplace until the completion of the first 5 days of antibiotic therapy or 21 days from the onset of cough for those who do not receive antibiotic treatment.

(2) If coughing >21 days:

(a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing. (See Section 2B for more information.)

(b) Treatment/prophylaxis: Antibiotic treatment for individuals is not recommended, as initiating treatment >21 days after onset of cough is unlikely to be beneficial. However, there are situations in which treatment is recommended >21 days after cough onset:

(i) Treatment should be initiated in any coughing individual who is culture positive, regardless of time since cough onset.

(ii) Please refer to Appendix A at the end of this chapter for further details.

(c) Exclusion: No exclusion is required.

ii. *Asymptomatic Health Care Personnel*: Asymptomatic contacts should be educated about the signs and symptoms of pertussis and should be advised to seek medical evaluation and testing, should symptoms develop.

(1) If last exposure occurred ≤21 days ago:

(a) Diagnostic evaluation: Refer for medical evaluation and diagnostic testing only if contact develops symptoms suggestive of pertussis. (See Section 2B for more information.)

(b) Treatment/prophylaxis: Prophylaxis is recommended for all health care personnel who have unprotected exposure to pertussis and are likely to expose a patient at risk of severe pertussis. Other health care personnel should either (a) receive post exposure antimicrobial prophylaxis or (b) be monitored daily for 21 days after pertussis exposure and treated at the time of onset of signs and symptoms of pertussis (and be excluded through day 5 of a regimen of appropriate antibiotics if they become symptomatic). (See the ACIP provisional recommendations for health care personnel listed in the references section.)

(c) Exclusion: No exclusion is required, unless appropriate antibiotics are not taken. If appropriate antibiotics are not taken, exclusion is for 21 days from last exposure to the infectious case.

(2) If last exposure occurred >21 days ago:

(a) Diagnostic evaluation: None needed.

(b) Prophylaxis: Antibiotic prophylaxis is not needed, as initiating prophylaxis >21 days after onset of cough is unlikely to be beneficial.

(c) Exclusion: No exclusion is required.

Notification

In addition to notifying providers, inform department heads, infection prevention personnel, employee health, and other relevant personnel/departments of confirmed and suspect cases.

Conduct Active Surveillance

Continue cough surveillance for two incubation periods (42 days) after the date of cough onset in the last case. This is of utmost importance in situations with high-risk individuals.

ADDITIONAL INFORMATION

The following are the Wisconsin and CDC surveillance case definitions for pertussis. They are provided for your information only, and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the WDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the WDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at http://www.cdc.gov/ncphi/disss/nndss/casedef/case_definitions.htm.

Case Definition for Pertussis (As Defined by CDC and WDPH)

Clinical Case Definition

A cough illness lasting ≥2 weeks with one or more of the following: paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, without other apparent cause.

Laboratory Criteria for Diagnosis

Isolation of *B. pertussis* from clinical specimen; or positive polymerase chain reaction (PCR) for *B. pertussis*.

Case Classification

Confirmed

Laboratory-Confirmed Case:

- An acute cough illness of any duration in which *Bordetella pertussis* has been isolated by culture from a patient specimen, OR
- An illness that meets the clinical case definition and a patient specimen is confirmed using polymerase chain reaction (PCR) as positive for *B. pertussis*

Epidemiologically-linked Confirmed Case:

- An illness that meets the clinical case definition AND the patient has a direct epidemiologic link to a patient with an illness that has been laboratory-confirmed as pertussis by either culture or PCR.

Probable

An illness that meets the clinical case definition but is not laboratory-confirmed and is not epidemiologically-linked to a laboratory-confirmed case.

Suspect (WDPH only)

A clinical syndrome or illness consistent or compatible with pertussis and without other apparent cause such as:

- Any acute cough illness with paroxysmal cough or inspiratory whoop
- Any acute cough illness in a person who is a close contact to a patient with a confirmed or probable case
- Any cough associated with apnea in an infant
- Any acute cough illness lasting ≥7 days when there is a reported outbreak of pertussis in the community
- Any acute cough illness with positive PCR results for *B. pertussis* that does not meet the clinical case definition.

Other Definitions

Epidemiologic link:
An individual with an epidemiologic link:

- Had close contact with a patient who had a laboratory-confirmed case AND that close contact occurred while the patient was infectious

  AND
- Had illness onset 6-21 days (the incubation period of pertussis) after* close contact with the patient who had a laboratory-confirmed case.

*Note: A patient with an epidemiologic link may have onset before or after disease onset in the patient with a laboratory-confirmed case.

Acceptable laboratory confirmation:
Detection of *B. pertussis* by either culture or PCR. Serologic and direct fluorescent antibody (DFA) tests are not acceptable.

REFERENCES

American Academy of Pediatrics. Pertussis. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, eds. *Red Book: 2009 Report of the Committee on Infectious Diseases*. 28th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2009: 504–518.

Centers for Disease Control and Prevention. In: Atkinson W, Wolfe S, Hamborsky J, McIntyre L, eds. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 11th ed. Washington DC: Public Health Foundation, 2009: 199-216. Available at: http://www.cdc.gov/vaccines/pubs/pinkbook/pink-chapters.htm

Centers for Disease Control and Prevention. Manual for the surveillance of vaccine-preventable diseases. Centers for Disease Control and Prevention, Atlanta, GA, 2008. Available at: http://www.cdc.gov/vaccines/pubs/surv-manual/

Centers for Disease Control and Prevention. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis (Tdap) Vaccine from the Advisory Committee on Immunization Practices, 2010. MMWR. 2011; 60(01);13-15. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6001a4.htm?s_cid=mm6001a4_w

Centers for Disease Control and Prevention. ACIP Provisional Recommendations for Health Care Personnel on use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine (Tdap) and use of Postexposure Antimicrobial Prophylaxis. April 2011. Available at: http://www.cdc.gov/vaccines/pubs/acip-list.htm#tdap

Centers for Disease Control and Prevention. Food and Drug Administration Approval of an Acellular Pertussis Vaccine for the Initial Four Doses of the Diphtheria, Tetanus, and Pertussis Vaccination Series. MMWR 1996; 45(31):676-677. http://www.cdc.gov/mmwr/preview/mmwrhtml/00043252.htm

Centers for Disease Control and Prevention. Updated Recommendations for Use of Tetanus Toxoid, Reduced Diptheria Toxoid and Acellular Pertussis (Tdap) Vaccine from the Advisory Committee on Immunization Practices, 2010. MMWR 2011; 60(1):13-15. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6001a4.htm

Centers for Disease Control and Prevention. Preventing Tetanus, Diphtheria and Pertussis Among Adolescents: Use of Tetanus, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines. MMWR 2006; 55(RR-3):1-43. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5503a1.htm

Centers for Disease Control and Prevention. Preventing Tetanus, Diphtheria and Pertussis Among Adults: Use of Tetanus, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines. MMWR 2006; 55(RR-17):1-37. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5517a1.htm

Centers for Disease Control and Prevention. Recommended Antimicrobial Agents for Treatment and Postexposure Prophylaxis of Pertussis: 2005 CDC Guidelines. MMWR 2005;54 (No. RR-14):1-16. http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm

Heymann DL, ed. Pertussis. *Control of Communicable Diseases Manual*. 19th ed. Washington, DC: American Public Health Association, 2008: 455-461.

Wendelboe AM, Van Rie A, Salmaso S, Englund JA. Duration of immunity against pertussis after natural infection or vaccination. Pediatr Infect Dis J. 2005 May;24(5 Suppl):S58-61.

APPENDIX A

Recommended Antibiotic Treatment and Prophylaxis of Pertussis

Antibiotics administered during the catarrhal stage of pertussis may ameliorate the disease. After the cough is established, antibiotic treatment may have no discernible effect on the course of illness but is recommended to reduce the duration of spread of *Bordetella pertussis* to 5 days after initiation of appropriate antibiotic treatment. The duration of spread from an untreated person is approximately 21 days.

A macrolide (typically azithromycin but also erythromycin or clarithromycin) is the antibiotic of choice for pertussis related treatment and prophylaxis. Following are age-specific antibiotic treatment and prophylaxis recommendations with a summary Table at the end of this document. The dosage, frequency, and duration of use of these antibiotics when used for prophylaxis are the same as when used for treatment. Any treatment schedule which differs from those described in this document are not recommended.

Providers should consider safety, potential interactions with concurrent medications, adherence to the prescribed regimen, and cost when choosing an appropriate antibiotic for any patient.

When a provider's index of suspicion is sufficiently high to test a patient for pertussis, we recommend that the patient be treated and counseled regarding prevention of spread, especially to contacts at high risk for acquiring severe disease (e.g., infants aged <1 year, pregnant women in last 3 weeks of pregnancy, persons with some immunodeficiency conditions or other underlying medical conditions such as chronic lung disease, respiratory insufficiency, or cystic fibrosis). The patient should be treated or prescribed prophylaxis regardless of vaccination status (with a pertussis-containing vaccine) and treatment should not be discontinued if a negative test result is received after starting antibiotics. It is also important for the patient's illness to be expeditiously reported to the local health department of jurisdiction. All Category 1 reportable diseases (pertussis included) shall be reported immediately by phone upon identification of a case or suspected case. Within 24 hours submit a case report online through the Wisconsin Electronic Disease Surveillance System (WEDSS) or by mail using an Acute and Communicable Disease Case Report (F44151).

No antibiotic treatment is indicated when a patient with a positive test result has been coughing for 21 days or more or when the patient with a positive test result is an infant aged <1 year who has been coughing for 42 days or more.

Treatment
Initiate treatment of persons aged ≥1 year within 21 days of cough onset. Initiate treatment of infants aged <1 year within 42 days of cough onset.

1. **Azithromycin**
   Recommended regimen (Azithromycin is administered as a single daily dose):
   - Infants aged <6 months: 10 mg/kg per day for 5 days.
   - Infants aged ≥6 months and children: 10 mg/kg (maximum: 500 mg) on day 1, followed by 5 mg/kg per day (maximum: 250 mg) on days 2-5.
   - Adults: 500 mg on day 1, followed by 250 mg per day on days 2-5.

2. **Erythromycin**
   Recommended regimen:
   - Infants aged <1 month: not preferred because of risk for infantile hypertrophic pyloric stenosis (IHPS). Azithromycin is the recommended antimicrobial agent. If azithromycin is

not available and erythromycin is used, the dose is 40-50 mg/kg per day in 4 divided doses for 14 days. Monitor infant for IHPS.

- Infants ≥1 month and older children: 40-50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days.
- Adults: 2 g per day in 4 divided doses for 14 days.

A 14-day course of erythromycin is recommended for treatment or for postexposure prophylaxis of close contacts of pertussis patients because relapses have been reported after completion of 7-10 days of treatment.

3. Clarithomycin

Recommended regimen:

- Infants aged <1 month: not recommended.
- Infants aged ≥1 month and children: 15 mg/kg per day (maximum: 1 g per day) in 2 divided doses each day for 7 days.
- Adults: 1 g per day in 2 divided doses for 7 days.

4. Trimethoprim-Sulfamethoxazole (TMP-SMX) Alternative treatment for patients who have contraindications to the use of macrolides.

TMP-SMX may be used as an alternative agent in patients who are allergic to macrolides, who cannot tolerate macrolides, or who are infected, rarely, with a macrolide-resistant strain of *B. pertussis*. TMP-SMX should not be administered to pregnant women, nursing mothers, or infants aged <2 months.

Recommended regimen:

- Infants aged <2 months: contraindicated.
- Infants aged ≥2 months and children: trimethoprim 8 mg/kg per day, sulfamethoxazole 40 mg/kg per day in 2 divided doses for 14 days.
- Adults: trimethoprim 320 mg per day, sulfamethoxazole 1,600 mg per day in 2 divided doses for 14 days.

5. Other antimicrobial agents

Although in vitro activity against *B. pertussis* has been demonstrated for other macrolides (e.g. roxithromycin and ketolides), no published data exist on the clinical effectiveness of these agents. No other antimicrobial agents are recommended for treatment or postexposure prophylaxis of pertussis because their clinical effectiveness has not been proven or because of their potentially harmful side effects in children.

Prophylaxis of Close Contacts

In general, antibiotic prophylaxis of close contacts is recommended if it is initiated within 21 days of close contact with the index case (the person with pertussis to whom the contact was exposed) while the index case was infectious (see Algorithm II).

While there are no formal guidelines from CDC regarding the re-prophylaxis of individuals exposed to pertussis after the completion of a first course of antibiotics, there may be instances when it is warranted. The following factors should be considered when deciding about re-prophylaxis:

- intensity/duration of exposure,
- is the individual at high risk of complications from pertussis (e.g. an infant, immunocompromised individual),
- time of exposure since completion of antibiotic (generally, the first 5 days after completion of Azithromycin can be considered as protected because of high serum antibiotic levels, therefore exposure during this time would not necessitate re-prophylaxis)
- risks/benefits of a second course of antibiotics

If you have any questions contact the Immunization Program at 608-267-9959.

References:

CDC. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC guidelines. MMWR 2005.
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5414a1.htm

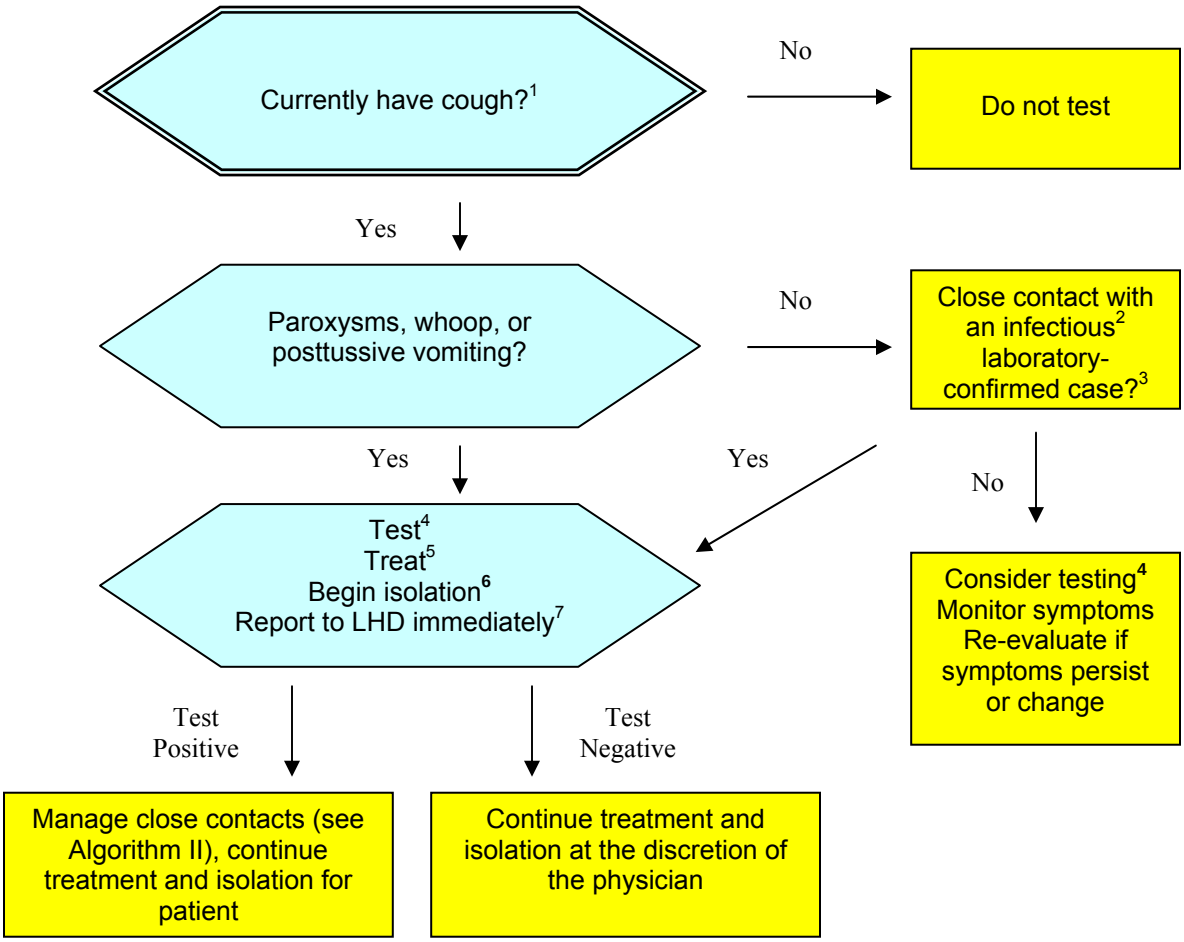
Table. Recommended antimicrobial treatment and postexposure prophylaxis for pertussis, by age group.

Age group	Azithromycin	Erythromycin	Clarithromycin	Alternate agent* TMP-SMX
<1 month[a]	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, SMX 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged ≥6 months) and children	10 mg/kg (maximum: 500 mg) in a single dose on day 1 then 5 mg/kg per day (maximum: 250 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, SMX 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, SMX 1,600 mg per day in 2 divided doses for 14 days

*Trimethoprim sulfamethoxazole (TMP–SMX) 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*. Because of the potential risk for kernicterus among infants, TMP-SMX should not be administered to pregnant women, nursing mothers or infants aged <2 months.

[a]Infants <1 month of age who receive any macrolide should be monitored for the development of IHPS for one month after completing the course.

Appendix B – Algorithm I: Clinical Evaluation and Management of Persons in Whom Pertussis is Being Considered



[1]Infants aged <1 year may only present with apnea. Proceed to "Test, treat, begin isolation and report to LHD immediately" if pertussis is strongly suspected.

[2]The infectious period is defined as 1 week before cough onset to 21 days after cough onset if untreated or 5 days after initiation of appropriate antibiotic therapy. Infants aged <1 year with pertussis remain infectious for longer periods (up to 42 days from cough onset) if untreated.

[3]The person being evaluated must have had illness onset within 6-21 days after this close contact.

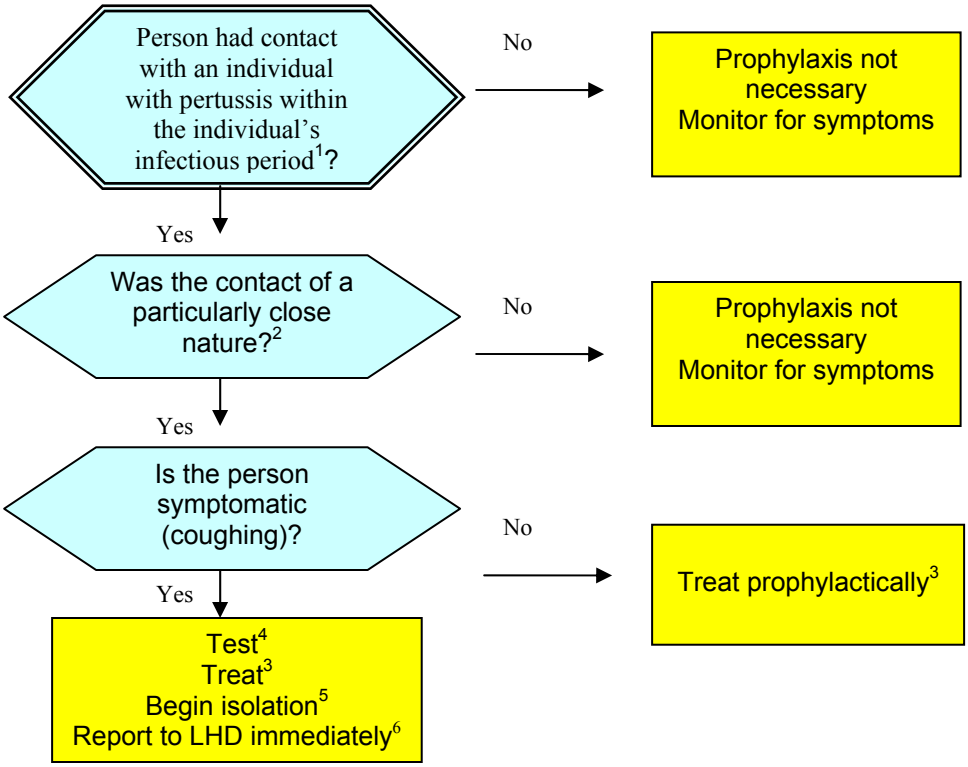
[4]Culture is most successful if performed during the first 14 days following cough onset and polymerase chain reaction (PCR), within the first 21 days. Testing should only be done on symptomatic persons. If feasible, specimens should be collected for both PCR and culture. If specimens for both tests cannot be collected, PCR testing is preferred.

[5]Treat the patient within 21 days of cough onset (or within 42 days of cough onset for infants aged <1 year) with an appropriate antibiotic. A macrolide is the antibiotic of choice for treatment and prophylaxis of pertussis. Treat regardless of vaccination status. Offer prophylaxis to all close contacts prior to receipt of the test result. Re-prophylaxis of individuals exposed to pertussis after the completion of a first course of antibiotics may be warranted in certain circumstances. See page 26, "Prophylaxis of Close Contacts".

[6]Exclude patients from work, school or other public contact until at least 5 days of appropriate antibiotic treatment have been completed or until 21 days after onset of cough if appropriate antibiotic treatment is not taken.

[7]Your Local Health Department (LHD) will assist with isolation and contact management. Note that pertussis is a Category 1 reportable disease.

Appendix C – Algorithm II: Clinical Guidelines for Management of Contacts of an Individual with Pertussis



[1]The infectious period is defined as 1 week before cough onset to 21 days after cough onset if untreated or 5 days after initiation of appropriate antibiotic therapy. Infants aged <1 year with pertussis remain infectious for longer periods (up to 42 days from cough onset) if untreated.

[2]**Close contact** includes:

- Direct face-to-face contact for a period of time (duration not defined)
- Shared confined space in close proximity for a prolonged period of time, such as ≥1 hour
- Direct contact with respiratory, oral, or nasal secretions (e.g., an explosive cough or sneeze in the face). Note: Droplet precautions apply only if the suspected exposure occurred within a 3-ft radius.
- Contact in a setting with known pertussis transmission (e.g., two or more cases in same classroom or sports team).

[3]Prophylactically treat the patient with an appropriate antibiotic if within 21 days of last contact with a case. If the person is symptomatic, treat (with an appropriate antibiotic) if within 21 days of cough onset or within 42 days of cough onset for infants aged <1 year. A macrolide is the antibiotic of choice for treatment and prophylaxis of pertussis. Treat regardless of vaccination status. Re-prophylaxis of individuals exposed to pertussis after the completion of a first course of antibiotics may be warranted in certain circumstances. See page 26, "Prophylaxis of Close Contacts".

[4]Culture is most successful if performed during the first 14 days following cough onset and polymerase chain reaction (PCR), within the first 21 days. Testing should only be done on symptomatic persons. If feasible, specimens should be collected for both PCR and culture. If specimens for both tests cannot be collected, PCR testing is preferred.

[5]Exclude patients from work, school or other public contact until at least 5 days of appropriate antibiotic treatment have been completed or until 21 days after onset of cough if appropriate antibiotic treatment is not taken.

[6]Your Local Health Department (LHD) will assist with isolation and contact management. Note that pertussis is a Category 1 reportable disease.

Pertussis

(Also known as Whooping Cough)

LHD Action Steps

This form does not need to be submitted to the WDPH with the case report form. It is for LHD use and is meant as a quick-reference guide to pertussis case investigation activities.

LHD staff should follow these steps when pertussis is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding pages of this document.

Reporting

- □ Immediately notify, by telephone, the WDPH Regional Immunization Representative, (http://www.dhs.wisconsin.gov/immunization/regiondepts.htm) of any suspected case of pertussis.
- □ Enter all known information on the case into the Wisconsin Electronic Disease Surveillance System (WEDSS).

Case Investigation

- □ Ensure that appropriate clinical specimens are collected and submitted for pertussis testing.
- □ Obtain the information necessary for completion of the case report form in WEDSS, including source of exposure, clinical information, vaccination history, laboratory results, and source of infection.

Prevention and Control

- □ Institute isolation and exclusion requirements and other control measures, as they apply to a particular case.
- □ Identify close contacts, paying particular attention to those who are high-risk or transmission-risk contacts.
- □ Recommend antibiotic prophylaxis, if appropriate.
- □ Conduct surveillance for two incubation periods.

Managing Pertussis in Schools and Other Institutions

In addition to the prevention and control measures described above:

- □ Notify and educate staff, students, and/or patients.
- □ Test and exclude symptomatic contacts, as indicated.

Managing Pertussis in Health Care Settings

In addition to the prevention and control measures described above:

- □ Notify infection control or employee health of confirmed or suspect case(s) in their institution.

- □ Test and exclude symptomatic contacts, as indicated.
- □ Ensure all health care personnel are receiving antibiotic prophylaxis when indicated.
- □ Exclude personnel from the workplace if appropriate antibiotics are not taken.