



## PERTUSSIS (Whooping Cough)

1. **Agent:** *Bordetella pertussis*, a Gram-negative pleomorphic bacillus.
2. **Identification:**
  - a. **Symptoms:** Acute bacterial disease of the tracheobronchial tree. Insidious onset of mild upper respiratory tract symptoms (catarrhal stage) for 1-2 weeks followed by a cough which becomes paroxysmal within 1 to 2 weeks, usually lasting 1 to 2 months (paroxysmal stage). Paroxysms are characterized by repeated violent cough episodes without inhalation followed by characteristic high-pitched inspiratory whoop, frequently ending with expulsion of clear, tenacious mucus. Fever is usually absent or minimal if present. Cases may not show typical paroxysms or whoop. Post-tussive vomiting is commonly seen and infants can present with apnea.
  - b. **Differential Diagnosis:** A whooping cough syndrome may also be caused by *Bordetella parapertussis*, *Mycoplasma pneumoniae*, *Chlamydia trachomatis*, *Chlamydia pneumoniae*, *Bordetella bronchiseptica* (although rarely), and certain adenoviruses. *Bordetella parapertussis* may cause a portion of the clinical cases of pertussis, especially milder cases, and has been reported as the single agent or as a dual infection with *B pertussis* in laboratory-confirmed cases.
  - c. **Diagnosis:** Clinical syndrome, isolation of organism from nasopharyngeal swab on Bordet-Gengou media, or Regan-Lowe agar plates. Strikingly elevated white blood cell count with a lymphocytosis occurs in 80% of the cases but may result from other causes. Serological tests may support a probable diagnosis, but only a positive culture, or positive polymerase chain reaction (PCR) test result in someone with the clinical syndrome, confirms the diagnosis of pertussis.
3. **Incubation:** Usually 7-14 days, rarely as short as 5 days or as long as 21 days.
4. **Reservoir:** Human.
5. **Source:** Respiratory tract secretions of infected persons.
6. **Transmission:** Principally respiratory by droplet spread; indirect spread through articles soiled with discharges is possible.
7. **Communicability:** Greater in the catarrhal stage before paroxysms. Tapers off until 21 days after onset of paroxysms, if untreated; only 5 days if treated. There exists a 70-100% secondary attack rate for susceptible household contacts.
8. **Specific Treatment:** Antibiotic treatment may shorten period of communicability but must be given early to modify clinical manifestations. Initiating treatment 3 or more weeks after cough onset has limited benefit to the patient. See section under "Contacts" for medications and recommended dose and duration for each of these agents. Dosage and duration of treatment is the same for treatment and post-exposure prophylaxis.
9. **Immunity:** Immunity due to natural infection has been shown to wane in adolescence and adulthood. Immunity conferred by the pertussis component of the DTP/DTaP vaccine decreases over time with little or no protection 5 to 10 years following the last dose. Even with full immunizations some exposed infants and children may still develop disease, although much milder.

### REPORTING PROCEDURES

1. **Reportable:** *California Code of Regulations*, Section 2500. Report within 1 working day of identification of case or suspected case by mail, telephone, fax, or electronic transmission. Do not wait to report until lab confirmation is available.



**Report Form: PERTUSSIS CASE REPORT  
(CDPH 8258)<sup>1</sup>**

**PERTUSSIS DEATH WORKSHEET<sup>2</sup>**

**Pertussis Death Worksheet Instructions<sup>3</sup>**

**2. Epidemiologic Data (Guidance for Health Districts):**

- a. Onset and duration of cough, clinical history, complications. Wait to do final interview at least 14 days after cough onset.
- b. Laboratory reports.
- c. Immunization status of patient: date(s) of administration, type of vaccine, vaccine manufacturer(s), lot number(s), reason for non-vaccination.
- d. For infants <12 months of age: determine hospital of birth, whether or not mother received Tdap during the pregnancy, and record highest WBC counts along with percent lymphocytes and test date.
- e. Exposure to people with cough.
- f. Clinical and immunization status of household and other contacts. Complete a case report/"epi" form" for every contact that has a cough of any duration with at least one of the following: (paroxysms, inspiratory whoop, or post-tussive vomiting). Consult with Immunization Program if there are any questions about the identification of new/presumptive cases.
- g. Additional data for hospitalized patients require obtaining hospital discharge summaries.

**CONTROL OF CASE, CONTACTS, AND CARRIERS**

**Public Health Nursing Protocol:**

Home visit is required – a face to face interview is required.

Refer to "Public Health Nursing Home Visit REQUIRED Algorithm" (B-73 Part IV Public Health Nursing Home Visit Protocol<sup>4</sup>).

Investigate within 24 hours.

**CASE:**

**Precautions:** If untreated, institute respiratory precautions for 21 days after onset of paroxysms. Separate from young children and infants, especially when un-immunized, until case has received at least 5 days of an appropriate antibiotic and agrees to complete the full course.

A case admitted to a hospital ward before diagnosis or effective treatment should be kept in respiratory isolation for at least 5 days after the start of a course of appropriate anti-microbial therapy.

**CONTACTS:**

Exposure to a case is defined as 1) shared confined space such as a closed classroom in close proximity for a prolonged period of time (i.e.,  $\geq 1$  hour with a symptomatic case); 2) direct face-to-face contact for any length of time with a symptomatic case; or 3) direct contact with respiratory, oral, or nasal secretions from a case in any setting. Only the following asymptomatic contacts should receive antibiotic prophylaxis (see sections 1 and 2 immediately below):

1. All asymptomatic **household** contacts should be given post-exposure antibiotic prophylaxis, regardless of age or immunization status. However, the initiation of antibiotic prophylaxis for contacts that were exposed to a pertussis case more than 3 weeks ago has limited benefit and should not be routinely done unless the contacts

<sup>1</sup> <http://publichealth.lacounty.gov/acd/Diseases/EpiForms/PertussisRep.pdf>

<sup>2</sup> <http://publichealth.lacounty.gov/acd/Diseases/EpiForms/PertussisDeathSheet.pdf>

<sup>3</sup> <http://publichealth.lacounty.gov/acd/Diseases/EpiForms/PertussisDeathSheetInstruc.pdf>

<sup>4</sup> <http://publichealth.lacounty.gov/acd/procs/b73/HomeVisitProtocol.pdf>



are at high risk for developing severe disease if they develop pertussis (e.g., infants or persons with severe lung disease) or unless they are health-care workers (or others) who are routinely exposed to high risk persons. In these instances, prophylaxis can be given for up to 6 weeks after exposure.

2. In addition to household contacts, any other asymptomatic contacts with pre-existing conditions that may be worsened by pertussis (i.e., immunocompromised persons, persons with chronic lung disease, persons with severe asthma, infants, women in their third trimester of pregnancy) should, also, be offered post-exposure antibiotic prophylaxis.

3. Monitor other asymptomatic close contacts who did not receive antibiotic prophylaxis for respiratory symptoms for 21 days after last contact with case during infectious period. Exclude symptomatic contacts from school/daycare pending physician evaluation.

#### School Exposures:

Classroom (not daycare) and other school related contacts to the pertussis case (i.e., band, sports teams) **who develop signs and symptoms of pertussis** should be referred to a health care provider for evaluation and if assessed to have pertussis, excluded from school for 21 days after their last exposure to a communicable pertussis case, or until they have received 5 days of an antibiotic regimen effective against pertussis and agree to complete the antibiotic regimen if the complete regimen is longer than 5 days. **Asymptomatic** close contacts for whom antibiotic prophylaxis is recommended because they have a preexisting condition that may be worsened by pertussis, can remain in school while completing antibiotic prophylaxis. If such asymptomatic children refuse prophylactics, they should be monitored for signs and symptoms of pertussis and if they develop such signs and symptoms, they should be handled as symptomatic school contacts as described in the first sentence of this paragraph. Based on recommendations from both the California Department of Public Health and the Centers for Disease Control and Prevention, asymptomatic close contacts that are **unimmunized or under-immunized against pertussis will not** be routinely excluded from school merely because of the pertussis exposure. Such persons will be monitored for symptoms of pertussis and referred

for clinical evaluation and antibiotic treatment as appropriate. If such persons are assessed to have pertussis, they will be excluded from school for 21 days after their last exposure to a communicable pertussis case or until they have received 5 days of an antibiotic regimen effective against pertussis and agree to complete the antibiotic regimen if the complete regimen is longer than 5 days. Because unimmunized or under-immunized children have been shown to be at risk for severe disease if they get pertussis, as compared to fully immunized children, it is reasonable to offer asymptomatic unimmunized or under-immunized children one course of post-exposure antibiotic prophylaxis. However, if they refuse antibiotic prophylaxis and are asymptomatic, they should not be routinely excluded from school.

Refer to the posted exposure notification template letters for school settings. Consult with Immunization Program for notification letters in other settings with school-aged children.

#### Daycare Exposures:

Because daycare settings are “closed settings” similar to family/home settings, all asymptomatic daycare center contacts to a pertussis case should be offered post-exposure antibiotic prophylaxis. However, an asymptomatic daycare center contact who refuses prophylaxis should not be excluded from daycare **unless the daycare center contact is unimmunized or under-immunized (for age) for pertussis**, in which case he/she can be excluded from daycare for 21 days since the last exposure to a communicable pertussis case until he/she has received 5 days of antibiotic prophylaxis. Consult with Immunization Program to obtain exposure notification template letters for daycare settings.

#### Hospital and Skilled Nursing Facility (SNF) Exposures:

Hospital or SNF staff with close (face-to-face or direct) personal contact with a communicable pertussis case and patients who have shared a room with a communicable pertussis case should receive antibiotic prophylaxis to interrupt further transmission. These patients and staff should also be cohorted in (i.e., restricted to) the involved ward and there should be no new admissions to the ward of inadequately immunized patients or of any patients less than 1 year of age, until all exposed patients and staff members have been on antibiotic prophylaxis for at least 5 days.



Consult with the Immunization Program regarding exposures in any other settings.

If more than one case of pertussis is identified in a facility, notify the Immunization Program as soon as possible.

#### Contacts Vaccination:

Un-immunized and under-immunized contacts should be immunized. If an infant or child under age 7 is un-immunized or has received less than 4 doses of DTP/DTaP, they should have pertussis immunization initiated or continued according to the recommended schedule. Children under age 7 who received their third dose 6 months or more before exposure should be given a fourth dose as soon as possible. Those who have received only 4 doses DTP/DTaP should receive a booster dose unless a dose has been given within the last 3 years or they are more than 6 years old. Persons 7 years of age and older who are unimmunized are not eligible to receive DTaP and should, therefore, receive Tdap, followed by two doses of Td in accordance with the Advisory Committee on Immunization Practices catch-up immunization schedule. Persons 10 years of age and older who received all required pertussis containing vaccine doses recommended for children less than 7 years of age and who have not yet received Tdap are eligible for Tdap and should receive it.

#### Treatment and Antibiotic Prophylaxis:

The recommended antibiotic prophylaxis and treatment regimens (which are the same) are listed below. Please be aware that current CDC guidelines recommend the exclusive use of azithromycin in infants under one month of age due to fewer adverse events compared to erythromycin. This is an “off-label” use of azithromycin.

##### a. Azithromycin:

- **Adults:** 500 mg orally in one dose on day 1, then 250 mg orally once a day on days 2-5.
- **Infants and Children  $\geq 6$  months:** 10 mg/kg (maximum: 500 mg/day) orally as one dose on day 1, followed

by 5 mg/kg/day orally (maximum: 250 mg/day) once daily on days 2-5.

- **Infants  $<6$  months:** 10 mg/kg/day orally once daily on days 1-5.
- **Note:** when initiating azithromycin prophylaxis or treatment, ask the individual for whom the antibiotic is prescribed (or guardian if person is a minor) if he/she is currently taking medications metabolized by the cytochrome P450 enzyme system of the liver (ex., benzodiazepines, theophylline, Elavil, Prozac, Paxil, Ketoconazole, Cimetidine, protease inhibitors) or other drugs such as digoxin, triazolam, and ergot alkaloids. If the answer is yes, advise the person (or guardian) that if he/she experiences heart palpitations or chest pain, they should stop taking azithromycin and contact their health care provider immediately.

##### b. Erythromycin:

- **Adults:** 2 g/day, orally in 4 divided doses each day X 14 days.
- **Children  $\geq 1$  month:** 40 to 50 mg/kg/day (maximum, 2 g/day) orally in 4 divided doses each day X 14 days.
- Erythromycin should be avoided in persons on medications that inhibit the CYP3A hepatic pathway.

##### c. Trimethoprim-sulfamethoxazole (TMP-SMX) (preferable for persons taking medications that inhibit the CYP3A hepatic pathway) (not for children under 2 months of age):

- **Adults:** 2 regular strength tablets or one double strength (DS) tablet orally BID X 14 days.
- **Children  $\geq 2$  months:** TMP-8 mg/kg/day and SMX-40 mg/kg/day orally in 2 divided doses each day X 14 days.
- (See pregnancy category C note for Clarithromycin below.)

##### d. Clarithromycin:

- **Adults:** 500 mg orally twice a day X 7 days



- Infants and Children  $\geq$  1 month: 15 mg/kg/day orally (maximum: 1 g/day) in 2 divided doses each day X 7 days.
- Clarithromycin should be avoided in persons on medications that inhibit the CYP3A hepatic pathway.

Note: both Clarithromycin and TMP-SMZ are classified by the FDA as pregnancy category C drugs because animal studies indicate an adverse effect on the fetus and no adequate studies exist in humans.

### PREVENTION-EDUCATION

1. Recommend immunization with DTP or DTaP for children under 7 years of age. Immunization required for school entry. California law allows exclusion from school during disease outbreaks if immunization status does not comply with *California Code of Regulations*, Title 17. An acellular pertussis vaccine, combined with tetanus and diphtheria toxoids, (Tdap) has been approved and is now recommended to replace the Td booster once for persons 11 years of age and older. However, pregnant women are recommended to receive a single dose of Tdap **with each** pregnancy, preferably between the 27<sup>th</sup> and 36<sup>th</sup> week of the pregnancy. Health care workers and other adults that have close contact with infants are especially recommended to

receive a single dose of Tdap as soon as feasible.

2. Proper cleaning or disposal of fomites soiled with nose and throat secretions.

### DIAGNOSTIC PROCEDURES

Organism is most likely to be isolated during catarrhal stage and first 1-2 weeks of paroxysmal cough stage; nasopharyngeal specimen should be obtained as soon as possible before antibiotic therapy begins and submitted for bacterial culture. (Special media required. Consult Public Health Laboratory to obtain appropriate media if not available onsite. Guidelines on obtaining a nasopharyngeal specimen are available from the Los Angeles County Immunization Program.) The PCR test is available commercially and can be used for lab confirmation in patients meeting the clinical criteria for pertussis. Fluorescent antibody (FA) tests as well as other direct antigen tests can yield rapid results but are often unreliable and **should not** be accepted for laboratory confirmation. Serological tests are available commercially but are often difficult to interpret due to lack of standardization and the inability to obtain acute specimens for comparison to convalescent specimens.

Viral serologic test to exclude adenoviral illness may be considered.