



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 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 polymerase chain reaction (PCR) test 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 of 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 chemoprophylaxis.
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/DTPaP 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.
2. **Report Form: PERTUSSIS CASE REPORT (DHS 8258, 10/05 fillable).**
3. **Epidemiologic Data:**
 - 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. Exposure to people with cough.
- e. Clinical and immunization status of household and other contacts.
- f. Follow up coughing contacts as possible cases.

CONTROL OF CASE, CONTACTS AND CARRIERS

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., ≥ 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.

A search for early, missed, or atypical cases is indicated when there is a potential for exposure of non-immune infants or young children.

1. Symptomatic contacts should be excluded from work, school and public gatherings for 21 days after exposure or until they have received

5 days of an appropriate antibiotic and agree to complete the entire course. Asymptomatic close contacts that elect not to take antibiotics and who are not up to date on their immunizations (especially infants who have not had 3 doses of pertussis containing vaccine) should be excluded from child-care or school for 21 days after their last exposure.

2. 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 who received their third dose 6 months or more before exposure should be given a fourth dose as soon as possible. Those who have had at least 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 10 years of age and older who are eligible for Tdap should receive it.
3. All household and other close contacts should be given chemoprophylaxis regardless of age or immunization status. However, the initiation of chemoprophylaxis 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 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.
4. The recommended chemoprophylaxis 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 the drug. Also, azithromycin and clarithromycin are approved for use in persons ≥ 6 months of age and are considered as effective as erythromycin.
 - a. **Erythromycin:**
 - **Adults:** 2 g/day, orally in 4 divided doses each day X 14 days.



- **Children ≥ 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.
- b. **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 ≥ 2 months:** TMP-8 mg/kg/day and SMX-40 mg/kg/day orally in 2 divided doses each day X 14 days.
- c. **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 ≥ 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.
- d. **Clarithromycin:**
- 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.
5. Hospital or SNF staff with close (face-to-face or direct) personal contact with case and patients who have shared a room with case should receive chemoprophylaxis 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 chemoprophylaxis for at least 5 days.
6. Monitor household and other close contacts for respiratory symptoms for 21 days after last contact with case during infectious period.

7. Exclude symptomatic contacts from school/daycare pending physician evaluation.

PREVENTION-EDUCATION

1. Recommend immunization with DTP or DTaP for children under 7 years of age. Immunization required for school entry. California law requires exclusion from school 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 11-64 years of age. 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 and are attached.) 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.