California Department of Public Health – July 2014

Pertussis: Public Health Investigation

Clinical symptoms

Catarrhal stage: Onset of cold-like symptoms (coryza, sneezing, occasional cough). Fever is absent or minimal. This stage lasts approximately 1-2 weeks with cough gradually becoming more severe.

Paroxysmal stage: Spasms of severe coughing are followed by a sudden deep inspiration, often resulting in a characteristic "whooping" sound. Post-tussive vomiting is common in all ages. Illness may be milder in previously vaccinated people.

Infants <1 year of age (particularly very young infants) may present differently:

- may have a shorter catarrhal stage
- may gag, gasp or stop breathing (apnea)
- facial color changes (may turn blue, purple or red)
- may not have noticeable cough or "whoop"
- likely to have leukocytosis (high white blood cell count) with an increased absolute lymphocyte count

Convalescent stage: Decreasing frequency and severity of coughing, whooping and vomiting. Coughing paroxysms may recur with subsequent respiratory infections. Classic pertussis is 6-10 weeks in duration, but cough may last longer in some people.

Modes of transmission

Pertussis is highly contagious. Transmission typically occurs when a susceptible person inhales aerosolized droplets from the respiratory tract of an infected person. Transmission via contact with fomites is thought to occur rarely, if ever.

Incubation period

Typically 7-10 days (range 5-21 days).

Period of communicability

Persons ≥1 year of age are considered infectious from the onset of cold-like symptoms until after 5 days of treatment or until 21 days after cough onset if no (or partial) treatment is given (infants < 1 year are considered infectious for 6 weeks without treatment).

CDPH case definitions

Confirmed case

- Acute cough illness of any duration with isolation of *B. pertussis* from a clinical specimen (culture positive); **or**
- Meets the clinical case definition AND is PCR positive for pertussis; **or**
- Meets the clinical case definition AND is a contact of a laboratory-confirmed pertussis case.

Probable case

- Meets the clinical case definition, is not laboratory-confirmed and is not epidemiologically linked to a laboratory-confirmed pertussis case; **or**
- FOR INFANTS <1 YEAR OF AGE ONLY:
  - Acute cough illness of any duration and at least one of the following: whoop, paroxysm, post-tussive vomiting or apnea (with or without cyanosis) AND PCR positive for pertussis; **or**
  - Acute cough illness of any duration and at least one of the following: whoop, paroxysm, post-tussive vomiting or apnea (with or without cyanosis) AND is a contact of a laboratory-confirmed pertussis case

Suspect case

- Acute cough illness of any duration AND is PCR positive for pertussis; **or**
- Acute cough illness of any duration and at least one: whoop, paroxysm or post-tussive vomiting AND is a contact of a laboratory-confirmed pertussis case

Clinical case definition

In the absence of a more likely diagnosis, a cough illness lasting ≥2 weeks with at least one of the following:

- Paroxysms of coughing;* or
- Inspiratory "whoop;" or
- Post-tussive vomiting; or
- Apnea± (with or without cyanosis) (FOR INFANTS <1 YEAR OF AGE ONLY)

*Sudden uncontrollable "fits" or spells of coughing where one cough follows the next without a break for breath.
±Transient cessation of respiration occurring spontaneously or after a coughing spasm. Apnea is generally associated with cyanosis or syncope and might be accompanied by bradycardia. Apnea is a common pertussis symptom in infants and might be the only presenting sign of pertussis in young infants with no cough but is rarely associated with pertussis in older children and adults

CDC laboratory criteria for diagnosis

Isolation of *B. pertussis* from clinical specimen or positive polymerase chain reaction (PCR) test for *B. pertussis*. For more information on laboratory testing, please see:

http://cdph.ca.gov/programs/immunize/documents/pertussislaboratorytesting.pdf

CDPH Immunization Branch/Division of Communicable Disease Control
850 Marina Bay Parkway, Building P, 2nd Floor, Richmond, CA 94804 - (510) 620-3737

Case investigation

1. Confirm that the suspected case meets the case definition and/or is highly suspected.
2. Determine if case is high-risk or has any contacts who are high-risk for severe pertussis or who may transmit the disease to persons at high-risk for severe pertussis (see definition of high-risk contact). Priority should be given to managing high-risk cases and contacts.
3. Ensure that case is recommended to receive antibiotic treatment if it is <21 days since cough onset (see recommendations on page 3).
4. Instruct high-risk contacts to seek medical attention if early symptoms of pertussis develop. Symptomatic contacts should receive antibiotic treatment per the recommendations on page 3.
5. Prioritize high-risk contacts for postexposure prophylaxis. Low-risk contacts may be advised to monitor for symptoms and seek treatment if symptoms develop. When recommended, prophylaxis should be implemented as soon as possible and within 21 days of last exposure to the infectious case.
6. Recommend vaccination for all persons who are not up-to-date for pertussis vaccine, using Tdap for people ≥7 years of age who have not already received it.
7. Alert clinicians and educate the public as indicated.

Close contact definition

Close contacts are defined as persons with exposure to a pertussis case where contact with respiratory aerosols is likely. The duration and intensity of exposure needed to cause infection are unclear. However, being a household member, attending or working in the same childcare setting, receiving a cough or sneeze in the face, performing a medical examination of the mouth, nose or throat, sitting at adjacent desks or the same table at school, or sharing a confined space with an infectious person for ≥1 hour are generally considered significant exposures.

High-risk contact definition

Contacts at the highest risk of severe disease or of transmitting disease to high-risk people should be prioritized for postexposure prophylaxis. High-risk contacts include:

- Infants <1 year of age;
- Pregnant women in their third trimester;
- Household contacts, particularly if there is an infant or third trimester pregnant woman in the household;
- Caregivers and household contacts of infants (e.g., family members, friends, or babysitters who spend time caring for an infant); and
- All those attending or working in a childcare setting (i.e., same room) *if* there is an infant or a third trimester pregnant woman in the setting.

Management of cases in childcare settings

- Exclude case from the setting until 5 days of appropriate antibiotic treatment (or 21 days after cough onset if no treatment).
- Notify parents/guardians and staff about pertussis signs/symptoms, prevention and control measures, and who is considered a high-risk contact. Consider active surveillance for cough illness and exclusion of those with cough until evaluation by healthcare provider.

Management of cases in K-12 school settings when pertussis is known to be widespread in the community

- In a setting of increased pertussis incidence, the benefit of school exclusion until cases complete 5 days of treatment is unclear. Local health jurisdictions may consider permitting cases to attend school after 3 days of treatment if they are well enough to participate in school activities.
- School exclusion of unvaccinated students is generally not indicated.
- CDC no longer has a pertussis outbreak definition; reporting of outbreaks (however defined) from local health jurisdictions to CDPH when pertussis incidence is high is not required.
- Local health jurisdictions should instruct schools about management of pertussis cases.

Management of exposed healthcare workers

Healthcare workers with unprotected (i.e., unmasked) exposure to pertussis cases may be managed in two ways:

1. They may be offered postexposure prophylaxis; or
2. They may self-monitor for symptoms for 21 days from the time of exposure.

Decisions on whether to offer prophylaxis or initiate symptom watch should take in to consideration the patient population seen by the HCW and the likely frequency of exposures, e.g., antibiotics would likely be preferred over symptom watch for a HCW in a neonatal intensive care unit, but symptom watch may be preferred for a HCW in a pediatric clinic where repeated exposures are likely.

Post-exposure chemoprophylaxis (PEP)

With increasing incidence and widespread community transmission of pertussis, extensive contact tracing and broad use of PEP among contacts is not an effective use of limited public health resources. While antibiotics may prevent pertussis disease if given prior to symptom onset, there are no data to indicate that widespread use of PEP among contacts effectively controls or limits the scope of pertussis outbreaks. Therefore, local health jurisdictions should focus antibiotic prophylaxis efforts on infants <1 year of age and their contacts since serious complications and death are primarily limited to these infants.

- CDC and AAP currently recommend PEP for all household contacts, regardless of age or immunization status, because secondary attack rates have been demonstrated to be high among families even when up-to-date with immunizations. However, CDPH considers it reasonable to prioritize PEP only to high-risk contacts or households, as noted above.
- Contacts who have not received PEP should be instructed to monitor themselves closely for cold-like symptoms for 21 days after last exposure and notify contact their healthcare provider if symptoms occur so that antibiotic treatment can be implemented immediately.
- If 21 days have elapsed since last exposure to an infectious case, PEP has limited value but should be considered for households with high-risk contacts.
- Broader use of PEP in limited closed settings, when a community-wide outbreak is not ongoing, may be considered; however when continued transmission of pertussis is evident, multiple rounds of antibiotics are not recommended.
- See table below for recommended agents and dosing for both postexposure prophylaxis and treatment by age of patient.

Pertussis vaccines

- The primary DTaP vaccine series is essential for reducing severe disease in young infants. During a community outbreak, infants can receive DTaP on an accelerated schedule with the first dose given at 6 weeks of age, and at least 4 weeks between each of the first three doses. Even one dose of DTaP may offer some protection against fatal pertussis in infants so accelerating even the first dose may be beneficial.
- All pregnant women should receive Tdap vaccine during every pregnancy regardless of vaccination history, preferably between 27-36 weeks gestation to maximize the maternal antibody response and passive antibody transfer to the infant.
- All persons in contact with infants should be up-to-date for pertussis vaccine. Although only one dose of Tdap is recommended by ACIP for adolescents and adults, persons may choose to be revaccinated if it has been several years since receipt of Tdap.
- Immunity to pertussis from vaccine or disease wanes over time and persons who have been vaccinated or had disease can become infected. Data on duration of protection from acellular vaccines suggest that waning occurs within 2-3 years of vaccination, particularly in persons who have never received whole-cell vaccine.

RECOMMENDED TREATMENT AND POSTEXPOSURE PROPHYLAXIS, BY AGE GROUP

Age group	*Azithromycin*	*Erythromycin**	*Clarithromycin*	*Alternate agent: TMP-SMX†*
<1 month	Recommended agent for infants <1 month of age; 10 mg/kg per day in a single dose x 5 days§.	40–50 mg/kg per day in 4 divided doses x 14 days	Not recommended.	Contraindicated in infants <2 months of age (risk for kernicterus).
1–5 months	10 mg/kg per day in a single dose x 5 days.	See above	15 mg/kg per day in 2 divided doses x 7 days.	Contraindicated in infants <2 months of age. For infants aged ≥2 months of age, TMP 8 mg/kg per day; SMX 40 mg/kg per day in 2 divided doses x 14 days.
Infants aged ≥6 months and children	10 mg/kg as a single dose on day 1 (maximum 500 mg); then 5 mg/kg per day as a single dose on days 2–5 (maximum 250 mg/day).	40 mg/kg per day in 4 divided doses for 7-14 days (maximum 1-2 g per day)	See above. (maximum 1g/day)	See above.
Adolescents and adults	500 mg as a single dose on day 1 then 250 mg as a single dose on days 2–5.	2g/day in 4 divided doses x 14 days.	1g/day in 2 divided doses x 7 days.	TMP 320 mg/day, SMX 1600mg/day in 2 divided doses x 14 days.

*Some experts prefer erythromycin estolate over erythromycin stearate or ethylsuccinate because it achieves higher serum levels with equal doses.

†Trimethoprim-sulfamethoxazole (TMP-SMX) can be used as an alternative agent to macrolides in patients ≥2 months of age who are not pregnant or nursing and are allergic to, cannot tolerate, or are infected with a rare macrolide-resistant strain of *B. pertussis.*

§Preferred macrolide for this age because of risk of idiopathic hypertrophic pyloric stenosis associated with erythromycin.