

More information is available at <http://www.cdph.ca.gov/HealthInfo/discond/Pages/Pertussis.aspx>.

PERTUSSIS VACCINES

Frequency of Tdap Boosters

Q. How often and at what interval should adolescents and adults receive Tdap booster shots?

A. Tdap booster shots appear to protect for at least 5 years. Since Tdap was licensed in the United States in 2005, a 2nd booster shot is not recommended at this time. As of March 2011, the federal Advisory Committee on Immunization Practices (ACIP) is awaiting additional data before recommending Tdap booster doses at the same (every 10 years) or different intervals as the Td booster shot which Tdap replaces. More information on this topic is available at <http://www.ncbi.nlm.nih.gov/pubmed/17945400> and <http://www.ncbi.nlm.nih.gov/pubmed/20704493>.

Q. How long should I wait to give Tdap after a prior Td tetanus booster shot?

There is no minimum waiting period per current [national ACIP](#) and [State CDPH](#) recommendations. The benefits of protection against pertussis from Tdap immunization outweigh any potential increased risk for minor adverse events that may occur after brief intervals. When a documented history of immunization with Tdap is not available, Tdap vaccine should be administered.

Tdap for persons older than 64 years

Q. What about Tdap vaccine for people older than 64 years of age, for whom Tdap is not currently licensed by US FDA?

A. [ACIP now recommends](#) a dose of Tdap for adults aged 65 years and older who have or anticipate having close contact with an infant younger than 12 months of age (e.g., grandparents, child-care providers, and health-care practitioners) and have not yet received Tdap. Other adults aged 65 years and older may receive a single dose of Tdap vaccine if they have not previously received Tdap. Tdap vaccine is a Medicare Part D (pharmacy) benefit. Providers should check with their respective health plans regarding coverage.

Tdap for children 7 through 9 years of age

Q. What about Tdap vaccine for children from 7 through 9 years of age, for whom neither DTaP nor Tdap is currently licensed by US FDA?

A. Children 7 through 9 years of age who did not receive all of their routine childhood DTaP vaccine doses are recommended by [CDPH](#) and [ACIP](#) to receive Tdap to help protect them against pertussis. In Canada Tdap is licensed to children as young as 4 years of age based on studies showing a similar immune response in children to either DTaP or Tdap after 4 early childhood doses of DTaP.

Tdap for children 10 years of age

Q. Should a child who was fully immunized with DTaP receive Tdap at age 10 years?

A. [CDPH](#) is recommending Tdap for all persons 10 years and older who haven't yet received a booster dose based on the higher incidence of disease in 2010 in children 10 years of age in California. A 10 year-old child who is being seen in clinic and has not yet received Tdap should be considered for Tdap.

Tdap for Health Care Workers

Q. Is Tdap vaccine recommended or required for health care workers?

A. CDPH and ACIP recommend that all health care personnel, particularly those who have direct contact with infants and pregnant women, be immunized with Tdap as soon as is feasible if they have not previously received it, regardless of the time since the last tetanus-diphtheria (Td) vaccine dose, to protect their patients and themselves. ACIP also recommends that hospitals and outpatient clinics should provide Tdap for health care personnel and take steps to maximize coverage, such as education, convenient access, and not charging for it.

Effective September 1, 2010, the [Cal/OSHA Aerosol Transmissible Disease Standard](#) requires all hospitals, outpatient medical facilities, and other employers covered by the Standard to offer Tdap immunization to their employees who may be exposed to pertussis. Employees who decline to be vaccinated must sign a declination form. The Standard also requires these facilities to offer employees immunizations that protect against influenza (annually), measles, mumps, rubella and varicella.

Availability of Tdap

Q. Is there a shortage of Tdap?

No, although CDPH has received a few reports of private distributors limiting providers' orders of Tdap.

Q. Where can we refer unimmunized parents for Tdap immunization?

A. Options for unimmunized parents depend on their location and may include

- Health care providers, preferably a regular provider or 'medical home' if available
- Community health centers, listed at <http://www.oshpd.ca.gov/RHPC/Clinics/FQHCS.html>)
- The California Vaccines for Children (VFC) Program serves persons younger than 19 years old who meet [eligibility criteria](#); VFC providers are listed at http://www.eziz.org/pages/vfc_locations2.html or call 1-877-243-8832)
- Routine local health department clinics, many of which are [listed on the CDPH website](#).
- Local pharmacies.

Single (non-combination) acellular pertussis vaccine?

Q. Is a pertussis vaccine that does not protect against other diseases available now or later?

No. All pertussis vaccines licensed in the United States also protect against tetanus and diphtheria. Similarly, there are no forthcoming vaccines that only protect against pertussis.

Efficacy of pertussis vaccines

Q. How effective are pertussis immunizations?

A. DTaP. The formulations of DTaP currently available in the United States are estimated to be 80-85% effective. Tdap was licensed on the basis of a comparable immunologic response after one dose of Tdap as after three doses of DTaP in infants.

Q. How soon after immunization with Tdap is an adult considered to be protected?

A. 1-2 weeks, although Tdap immunization is not 100% effective.

Q. How effective is Tdap for an adult that has never been immunized?

A. This is not known.

Safety of pertussis vaccines

Q. What are the potential adverse events that may occur after immunization against pertussis?

A. Please refer to the respective Vaccine Information Sheets.

DTaP - <http://www.cdc.gov/vaccines/pubs/vis/default.htm#dtap>

Tdap - <http://www.cdc.gov/vaccines/pubs/vis/default.htm#tdtap>

On occasion, persons receiving Tdap or Td booster shots will have a large local inflammatory (but non-infectious) reaction at the injection site that resembles a soft tissue infection (e.g., cellulitis). These reactions resolve in a week or less, and antibiotic treatment is of no benefit.

Q. What should I do if one of my patients has had an adverse event after immunization against pertussis?

A. Please report the adverse event to the federal Vaccine Adverse Event Reporting System (VAERS) at <http://vaers.hhs.gov/index>.

Q. What are the contraindications to receiving Tdap?

A. The only contraindications to immunization with Tdap, both rare, are:

- a documented history of anaphylaxis after receipt of Tdap, DTaP or their ingredients; or
- encephalopathy occurring within 7 days after immunization against pertussis that was not due to another identifiable cause.

The following conditions are not contraindications or precautions for Tdap, and adolescents or adults with these conditions can receive Tdap if otherwise indicated:

- High fever within 48 hours after pediatric DTP/DTaP not attributable to another cause;
- Collapse or shock-like state (hypotonic hyporesponsive episode) within 48 hours after pediatric DTP/DTaP;

- Persistent crying lasting >3 hours, occurring within 48 hours after pediatric DTP/DTaP;
- Convulsions with or without fever, occurring within 3 days after pediatric DTP/DTaP;
- History of an extensive limb swelling reaction following pediatric DTP/DTaP or Td that was not an Arthus reaction.
- Stable neurologic disorder including well-controlled seizures, a history of seizure disorder that has resolved, and cerebral palsy;
- Non-anaphylactic latex allergies (e.g., a history of contact allergy to latex gloves). The tip and rubber plunger of the BOOSTRIX® needleless syringe contain latex. The BOOSTRIX® single dose vial and ADACEL™ preparations contain no latex.
- Breastfeeding;
- Immunosuppression, including persons with human immunodeficiency virus (HIV);
- Intercurrent minor illness; and
- Use of antimicrobials.

For more information, see http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5503a1.htm?s_cid=rr5503a1_e or the Tdap VIS at <http://www.cdc.gov/vaccines/pubs/vis/default.htm#tdtap>.

Other questions about immunity and immunization to pertussis

Q. May we accelerate DTaP immunization in infants using a minimum interval of 4 weeks instead of the routine interval of 8 weeks?

A. Yes, see the schedule at [this link on the CDC website](#). To provide infants with protection against pertussis more promptly, the first dose of DTaP, or any combination vaccines containing DTaP, may be given as early as 6 weeks of age. Doses 2 and 3 may be given as soon as 4 weeks after the previous dose. However, some experts have suggested that administering the 3rd dose at the standard age of 6 months of age may provide longer immunity than an accelerated 3rd dose.

Q. My patient is delayed in starting or completing the DTaP immunization series. What is the recommended schedule for catching up?

A. See the schedule at [this link on the CDC website](#). If the 4th dose of DTaP is given on or after a child's 4th birthday, a fifth dose is not needed.

Q. After my patients have had pertussis disease, how long are they immune to pertussis? Do they need a Tdap booster if they have had pertussis?

A. Pertussis disease, just like immunization, provides temporary immunity against catching pertussis in the future. The temporary immunity from disease appears to last at least 4 years but probably varies a great deal between individuals. Adolescents or adults who have a history of pertussis should still receive Tdap according to the routine recommendations because the duration of protection from pertussis disease is variable and because the diagnosis of pertussis can be difficult to confirm. Administering pertussis vaccines to persons with a history of pertussis presents no additional safety concerns.

Q. Have children hospitalized with pertussis been previously immunized?

A. Yes, some immunized children become ill with pertussis because pertussis vaccines are less than 100% effective. However, the rates of illness or hospitalization in unimmunized children are much higher than those in immunized children.

TESTING FOR PERTUSSIS

Q. When does the lymphocytosis seen in pertussis disease reliably begin?

This is difficult to study given the typical delays in the diagnosis of pertussis. Blood counts are seldom obtained early in the illness.

Lymphocytosis is reasonably *specific* for pertussis – when detected in a person with a typical clinical illness, the diagnosis of pertussis is likely. Lymphocytosis is not a *sensitive* indicator of pertussis - many adolescents or adults with pertussis may not have lymphocytosis. When not detected on initial testing, subsequent blood counts may eventually show lymphocytosis. Lymphocytosis is more frequent in severe cases of pertussis, including lethal cases in infants.

Q. Can the same nasopharyngeal swab be used for both PCR and culture?

Many laboratories prefer two separate swabs to optimize the specimen yield of testing and to facilitate processing.

Q. Are there any videos on how to collect nasopharyngeal specimens for pertussis testing?

There are several available on the Internet, including the following links (No endorsement of any website or specimen collection materials should be implied):

<http://www.youtube.com/watch?v=DVJNWefmHjE&feature=related>

<http://vimeo.com/6563420>

Q: How can I avoid contamination of the PCR specimen?

See: <http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-pcr-bestpractices.html>

Adhere to Basic Infection-control Measures

- Wear clean gloves immediately before and during specimen collection or vaccine preparation and administration with immediate disposal of gloves after the procedure, and
- Clean clinic surfaces using a 10% bleach solution to reduce the amount of nucleic acids in the clinic environment.

To avoid contamination of specimens by pertussis vaccine DNA:

- Prepare and administer vaccines in areas separate from pertussis specimen collection to reduce the opportunity for cross contamination of clinical specimens.
- Take care to avoid contamination of surfaces when preparing and administering vaccines.
- Use of a semisolid or non-liquid transport media or transport of a dry swab without media should prevent contaminant DNA on the swab shaft from reaching the part of the specimen that is later extracted.

Q. How long does it take to obtain the result of PCR test / culture?

A. PCR testing for pertussis can be completed within a day. Positive pertussis cultures often grow within a few days. The timing of testing results may vary by facility and can be delayed when testing is performed at an outside laboratory.

Q. Is PCR testing reliable later in the infection? Does PCR distinguish between living and non viable bacteria?

A. Culture can only detect living bacteria, while PCR can detect nucleic acid from either living or nonviable bacteria. PCR testing can also detect pertussis bacteria at lower levels than culture, so PCR testing can be positive later in the paroxysmal phase of infection even after a culture is negative. Attention to proper technique is important to avoid potential contamination and false-positive PCR results.

PERTUSSIS DISEASE REPORTING

Q. What are the criteria for reporting cases of pertussis to the local public health department? Is clinical diagnosis sufficient or do I need a positive diagnostic test in order to report?

A. A clinical suspicion of pertussis is sufficient to report the patient's illness to the local public health department and to consider starting treatment.

ANTIBIOTIC TREATMENT AND PROPHYLAXIS

Q. What is the proper treatment or prophylaxis dosing for pertussis?

A. See [this CDPH guidance](#). The dosing for post-exposure prophylaxis is the same as for treatment. For infants younger than 6 months of age, the recommended dose of azithromycin is 10 mg/kg/day for 5 days.

Q. How long after disease onset should treatment be offered?

A. A patient who has been coughing for at least 3 weeks is unlikely to be infectious. Antimicrobial treatment at this point is not thought to hasten recovery or prevent transmission.

Q. Are quinolones useful in treating pertussis?

There have been no clinical trials of quinolone antibiotics for the treatment of pertussis. [Quinolone-resistant strains of *Bordetella pertussis* have been detected in Japan](#). See [this CDPH guidance](#) for recommended treatment options.

Q. Have there been any documented incidences of resistance to azithromycin (possibly due to over-use)?

Reports of *Bordetella pertussis* strains that are resistant to azithromycin or other macrolide antibiotics have been infrequent. Another benefit of routinely obtaining bacterial cultures from persons with pertussis is that the bacterial isolates can be tested for any emerging antimicrobial resistance.

Q. How soon after beginning a recommended antibiotic is a person with pertussis considered to be no longer contagious?

A. 5 days.

Q. What criteria should we use for post-exposure prophylaxis?

See [this CDPH guidance](#). The recommendations for post-exposure prophylaxis depend on the degree of contact with the case and the vulnerability of the contacts. Those at highest priority for post-exposure prophylaxis include close contacts who are high risk for severe pertussis, especially young infants, and those who could transmit pertussis to them, such as pregnant mothers and relatives of young infants.

Q. Who is defined as a 'close contact'?

A. See [this CDPH guidance](#). Those who have had the following contact with someone symptomatic for pertussis during the catarrhal or paroxysmal stage:

- direct contact with respiratory, oral or nasal secretions (e.g., a cough or sneeze in the face, sharing food/eating utensils, kissing, performing a medical examination of the nose and throat)
- sharing a confined space in close proximity for ≥ 1 hour

Q. I was planning to offer chemoprophylaxis to a close contact of a patient with pertussis. Does it matter if the close contact is fully immunized against pertussis?

A. No. The decision to offer chemoprophylaxis does not depend upon immunization status.

Q. Are patients with chronic diseases at higher priority for post-exposure prophylaxis?

A. Young infants and their close contacts, including pregnant women, are at highest priority for post-exposure prophylaxis. The decision to offer prophylaxis to patients with chronic diseases should take into consideration their vulnerability to severe respiratory disease as well as their degree of contact with the case and with young infants. All persons, especially those with chronic illnesses, should be immunized against pertussis.

OTHER INFECTION CONTROL MEASURES

Q. Which precautions should be used for caring for patients hospitalized with suspected or confirmed pertussis?

A. During clinic visits and hospitalizations of patients with suspected pertussis, implement droplet precautions until 5 days after initiation of appropriate antibiotic therapy, and implement standard precautions at all times.

Q. What work restrictions would you recommend for employees, especially those in high risk areas such as the NICU or pediatric wards and clinics?

A. Along with the precautions listed above in the previous question, healthcare workers, regardless of immunization status, should be monitored for the onset of respiratory infections. If they develop cough or cold symptoms

- when pertussis is circulating in the community
- after caring for a patient with suspected or known pertussis, or
- that are suggestive of pertussis

they should be removed from work and rigorously tested for pertussis. If testing is positive for pertussis, they should only return to work after 5 or more days of treatment with an appropriate antibiotic. If testing is negative for pertussis, they should not return to work until they are no longer ill.

All health care personnel should be encouraged to be immunized with Tdap, which is safe, effective and can minimize the chance of transmitting infection to patients. Hospitals can consider requiring immunization with Tdap for employees who are new or working in high-risk wards and clinics.

ACIP and CDPH recommends that health care personnel of all ages should receive a single dose of tetanus, diphtheria and pertussis (Tdap) vaccine as soon as is feasible if they have not previously received it, regardless of the time since the last tetanus-diphtheria (Td) vaccine dose. ACIP recommends that hospitals and outpatient clinics should provide Tdap for health care personnel and take steps to maximize coverage, such as education, convenient access, and not charging for it.

Q. What are the recommendations for employees who were exposed to a patient with pertussis?

See answers above. ACIP recommends post-exposure prophylaxis for all health care personnel with unprotected exposure to pertussis who are likely to expose a patient at high risk of complications from pertussis (e.g., infants, pregnant women, postpartum women or the severely immunosuppressed) regardless of Tdap immunization status. For employees who have been immunized with Tdap but don't work with infants, pregnant women, postpartum women or the severely immunosuppressed, daily monitoring for cough or cold symptoms alone (without post-exposure chemoprophylaxis) may be a reasonable alternative.

Q. Will wearing a properly-fitted N-95 respirator reduce the chance of contracting pertussis from an ill patient?

A. This is very likely, as N-95 respirators offer greater protection than surgical masks against inhalation of infectious aerosols. However, use of N-95 respirators is not required at present for working with patients with pertussis.

Q. How should treatment, isolation/precautions or exposures be handled for cases caused by *Bordetella parapertussis* as compared to *B. pertussis*?

A. Use the same measures for cases caused by either bacterium. Although its symptoms are similar, parapertussis tends to be milder than pertussis because *B. parapertussis* does not produce pertussis toxin; hospitalized cases of parapertussis are uncommon.