
Pertussis (Whooping Cough): Questions and Answers

Information about the disease and vaccines

What causes pertussis?

Pertussis, commonly known as whooping cough, is caused by a bacterium, *Bordetella pertussis*.

How does pertussis spread?

Pertussis is spread through the air by infectious droplets and is highly contagious.

How long does it take to show signs of pertussis after being exposed?

The incubation period of pertussis is commonly 7 to 10 days, with a range of 4–21 days.

What are the symptoms of pertussis?

Pertussis disease can be divided into three stages:

Catarrhal stage: can last 1–2 weeks and includes a runny nose, sneezing, low-grade fever, and a mild cough (all similar symptoms to the common cold).

Paroxysmal stage: usually lasts 1–6 weeks, but can persist for up to 10 weeks. The characteristic symptom is a burst, or paroxysm, of numerous, rapid coughs. At the end of the cough paroxysm, the patient can suffer from a long inhaling effort that is characterized by a high-pitched whoop (hence the name, "whooping cough"). Infants and young children often appear very ill and distressed, and may turn blue and vomit. "Whooping" does not necessarily have to accompany the cough.

Convalescent stage: usually lasts 2–6 weeks, but may last for months. Although the cough usually disappears after 2–3 weeks, paroxysms may recur whenever the patient suffers any subsequent respiratory infection. The disease is usually milder in adolescents and adults, consisting of a persistent cough similar to that found in other upper respiratory infections. However, these individuals are still able to transmit the disease to others, including unimmunized or incompletely immunized infants.

How serious is pertussis?

Pertussis can be a very serious disease, especially for infants. Infants (6 months of age and younger) are the children most likely to die from this disease. Rates of hospitalization and complications increase with decreasing age. The breathing difficulties associated with this disease can be very distressing and frightening for the patient and his or her family. Although adults are less likely than infants to become seriously ill with pertussis, most make repeat-

ed visits for medical care and miss work, especially when pertussis is not initially considered as a reason for their long-term cough. In addition, adults with pertussis infection have been shown to be a frequent source of infection to infants with whom they have close contact.

What are possible complications from pertussis?

Younger patients have a greater chance of complications from pertussis than older patients. The most common complication is secondary bacterial infection, which is the cause of most pertussis-related deaths. Pneumonia occurs in one out of 20 cases; this percentage is higher for infants younger than age 6 months.

Infants are also more likely to suffer from such neurologic complications such as seizures and encephalopathy, probably due to the reduction of oxygen supply to the brain. Other less serious complications include ear infection, loss of appetite, and dehydration.

Adults with pertussis can have complications such as pneumonia (up to 5% of cases) and rib fracture from coughing (up to 4% of cases). Other reported side effects include (among others), loss of consciousness, female urinary incontinence, hernias, angina, and weight loss.

How do I know if my child has pertussis?

The diagnosis of pertussis is usually made based on its characteristic history and physical examination. A laboratory test may be done, which involves taking a specimen from the back of the patient's throat (through the nose).

Is there a treatment for pertussis?

Antibiotics are necessary in treating pertussis cases. The drug of choice is usually a form of erythromycin that is also given to all household and other close contacts of the patient to minimize transmission, regardless of age and vaccination status.

Patients also need supportive therapy such as bed rest, fluids, and control of fever.

All close contacts younger than seven years of age should complete their DTaP vaccine series if they have not already done so. If they have completed their primary four dose series, but have not had a

dose from age 4 to 6 years, they should be given a booster dose if it has been at least 6 months since the last dose. People age 10 years and older should receive a dose of Tdap if they haven't received it already.

How long is a person with pertussis contagious?

People with pertussis are most infectious during the catarrhal period and during the first two weeks after onset of the cough (approximately 21 days).

How common is pertussis in the United States?

Before a vaccine against pertussis was available, pertussis (whooping cough) was a major cause of childhood illness and death in the United States. From 1940–1945, over one million cases of pertussis were reported. With the introduction of a vaccine in the late 1940s, the number of reported pertussis cases in the U.S. declined from approximately 200,000 a year in the pre-vaccine era to a low of 1,010 cases in 1976.

Since the 1980s, the number of cases of pertussis has increased, especially among babies younger than 6 months and teenagers. In recent years, several states have reported a significant increase in cases, with outbreaks of pertussis reaching epidemic levels in some states. Many infants have died from whooping cough during this epidemic.

Can you get pertussis more than once?

Reinfection appears to be uncommon but does occur. With natural infection, immunity to pertussis will likely wane as soon as seven years following disease; reinfection may present as a persistent cough, rather than typical pertussis.

When did vaccine first become available for diphtheria, tetanus, and pertussis?

The first inactivated toxin, or toxoid, against diphtheria was developed around 1921, but it was not widely used until the 1930s. In 1924, the first tetanus toxoid (inactivated toxin) was produced and was used successfully to prevent tetanus in the armed services during World War II. The first pertussis vaccine was developed in the 1930s and was in widespread use by the mid-1940s, when pertussis vaccine was combined with diphtheria and tetanus toxoids to make the combination DTP vaccine. A series of 4 doses of whole-cell DTP vaccine was quite (70–90%) effective in preventing serious pertussis disease; however, up to half of the children who received the vaccine developed local reactions such as redness, swelling, and pain at the injection site. In 1991, concerns about safety led to the development

of more purified (acellular) pertussis vaccines that are associated with fewer side effects. These acellular pertussis vaccines have replaced the whole cell DTP vaccines in the U.S.

In 2005, two new vaccine products were licensed for use in adolescents and adults that combine the tetanus and diphtheria toxoids with acellular pertussis (Tdap) vaccine. These vaccines are the first acellular pertussis-containing vaccines that make it possible to vaccinate adolescents and adults against pertussis.

How are vaccines made that prevent diphtheria, tetanus and pertussis?

These vaccines are made by chemically treating the diphtheria, tetanus, and pertussis toxins to render them nontoxic yet still capable of eliciting an immune response in the vaccinated person. They are known as “inactivated” vaccines because they do not contain live bacteria and cannot replicate themselves, which is why multiple doses are needed to produce immunity.

What's the difference between all the vaccines containing diphtheria and tetanus toxoids and pertussis vaccine?

It's like alphabet soup! Here is a listing of the various products:

- DTaP: Diphtheria and tetanus toxoids and acellular pertussis vaccine; given to infants and children ages 6 weeks through 6 years. In addition, three childhood combination vaccines include DTaP as a component.
- DT: Diphtheria and tetanus toxoids, without the pertussis component; given to infants and children ages 6 weeks through 6 years who have a contraindication to the pertussis component.
- Tdap: Tetanus and diphtheria toxoids with acellular pertussis vaccine; given to adolescents and adults, usually as a single dose; the exception is pregnant women who should receive Tdap during each pregnancy.
- Td: Tetanus and diphtheria toxoids; given to children and adults ages 7 years and older. Note the small “d” which indicates a much smaller quantity of diphtheria toxoid than in the pediatric DTaP formulation.

How are these vaccines given?

The DTaP and DT preparations are all given as an injection in the anterolateral thigh muscle (for infants and young toddlers) or in the deltoid muscle (for older children and adults). Tdap and Td are given

in the deltoid muscle for children and adults age 7 years and older.

Who should get these vaccines?

All children, beginning at age 2 months, and all adults need protection against these three diseases—diphtheria, tetanus, and pertussis (whooping cough). Routine booster doses are also needed throughout life.

How many doses of vaccine are needed?

The usual schedule for infants is a series of four doses of DTaP given at 2, 4, 6, and 15–18 months of age. A fifth shot, or booster dose, is recommended between age 4 and 6 years, unless the fourth dose was given late (after the fourth birthday).

For people who were never vaccinated or who may have started but not completed a series of shots, a 3-dose series of Td should be given with 1 to 2 months between dose #1 and #2, and 6 to 12 months between dose #2 and #3. One of the doses, preferably the first, should also contain the pertussis component in the form of Tdap.

Because immunity to diphtheria and tetanus wanes with time, boosters of Td are needed every ten years.

When adolescents and adults are scheduled for their routine tetanus and diphtheria booster, should they get vaccinated with Td or Tdap?

Immunization experts recommend that the first dose of Tdap be given to all adolescents at age 11–12 years as a booster during the routine adolescent immunization visit if the adolescent has finished the childhood DTaP schedule and has not already received a dose of Td or Tdap. If a child age 7–10 years did not complete a primary series in childhood, a dose of Tdap may be given earlier as part of the catch-up vaccinations.

All adults should receive a single dose of Tdap as soon as feasible. Then, subsequent booster doses of Td should be given every ten years. Pregnant teens and women should receive Tdap during each pregnancy. Adolescents and adults who have recently received Td vaccine can be given Tdap without any waiting period.

If someone experiences a deep or puncture wound, or a wound contaminated with dirt, an additional booster dose may be given if the last dose was more than five years ago. This could be a dose of Td or Tdap, depending on the person's vaccination history. It is important to keep an up-to-date record of all immunizations so that repeat doses don't be-

come necessary. Although it is vital to be adequately protected, receiving more doses than recommended can lead to increased local reactions, such as painful swelling of the arm.

Who recommends the use of these vaccines?

The Centers for Disease Control and Prevention (CDC), the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Physicians (ACP) all recommend this vaccine.

What side effects have been reported with these vaccines?

Local reactions, such as fever, redness and swelling at the injection site, and soreness and tenderness where the shot was given, are not uncommon in children and adults. These minor local and systemic adverse reactions are much less common with acellular DTaP vaccine; however, a determination of more rare adverse effects can only be made when additional data are available following extended use of DTaP.

Side effects following Td or Tdap in older children and adults include redness and swelling at the injection site (following Td) and generalized body aches, and tiredness (following Tdap). Older children and adults who received more than the recommended doses of Td/Tdap vaccine can experience increased local reactions, such as painful swelling of the arm. This is due to the high levels of tetanus antibody in their blood.

How effective are these vaccines?

After a properly spaced primary series of DTaP or Td/Tdap, approximately 95% of people will have protective levels of diphtheria antitoxin and 100% will have protective levels of tetanus antitoxin in their blood. However, antitoxin levels decrease with time so routine boosters with tetanus and diphtheria toxoids are recommended every 10 years. Estimates of acellular pertussis vaccine efficacy range from 80% to 85%—a level believed to be far more efficacious than the previously-used whole cell pertussis vaccine.

Can a pregnant woman receive Tdap vaccine?

Yes. All pregnant women should receive Tdap during each pregnancy, preferably between 27 and 36 weeks' gestation. Because infants are not adequately protected against pertussis until they have received at least 3 doses of DTaP, it is especially important that all contacts (family members, caregivers) of infants younger than age 12 months are vaccinated with Tdap. If a new mother hasn't been vaccinated with

Tdap, she should receive it before hospital discharge, even if she is breastfeeding.

Who should not receive these vaccines?

Generally, any person who has had a serious allergic reaction to a vaccine component or a prior dose of the vaccine should not receive another dose of the same vaccine. People who had a serious allergic reaction to a previous dose of DTaP or Tdap vaccine should not receive another dose.

Certain rare adverse events following pertussis vaccination usually serve as a precaution against receiving further doses. Such events include a temperature of 105°F or higher within two days, collapse or shock-like state within two days, persistent crying for more than three hours within two days, or convulsions within three days. Even if one of these precautions exists, there may be occasions when the benefit of immunization outweighs the risk (for example, during a community-wide outbreak of pertussis). A person who developed one of these adverse events after pediatric DTaP vaccine may receive Tdap as an adolescent or adult.

A person with a recognized, possible, or potential neurologic condition should delay receiving DTaP or Tdap vaccine until the condition is evaluated, treated, and/or stabilized. Although DTaP vaccine does not cause neurological disorders, receiving the vaccine can cause an already-present underlying condition to show itself.

Can the vaccine cause the disease?

No.