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# Pertussis: Questions and Answers

## *Information about the disease and vaccines*

### **What causes pertussis?**

Pertussis 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 seven to 10 days, with a range of 5-21 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 4-6 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 paroxysm the patient suffers 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.

**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. Rates of hospitalization and complications increase with decreasing age. Of the 100 deaths from pertussis during 2000-2004, 76 occurred in infants age one month or younger. Infants younger than age one year accounted for 19% of pertussis cases and 92% of pertussis deaths in the United States during 2000-2004. As noted above in the section on symptoms, the breathing difficulties associ-

ated with this disease can be very distressing and scary for the patient and his or her family.

Although adults are less likely than infants to become seriously ill with pertussis, most make repeated 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 an important source of infection to infants with whom they have close contact.

### **What are possible complications from pertussis?**

Again, 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.

Infants are also more likely to suffer from such neurologic complications as seizures and encephalopathy, probably due to the reduction of oxygen supply to the brain. In 1997-2000, 0.8% of all cases, and 1.4% of cases under six months of age, involved seizures.

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 somewhat helpful in treating pertussis. The drug of choice is usually erythromycin. This antibiotic should also be given for 14 days to all household and other close contacts of the patient to minimize transmission, regardless of age and vaccination status.

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 within the last three years, they should be given a booster dose.

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

#### **How long is a person with pertussis contagious?**

Persons 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, whooping cough was a major cause of childhood sickness 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 pertussis cases reported nationally fell from approximately 200,000 a year in the pre-vaccine era to a low of 1,010 cases in 1976.

Unfortunately, since then, a steady increase in reported pertussis cases has occurred, with proportionately more cases in adults and adolescents. In 2004, 25,827 cases of pertussis were reported to CDC, the highest number since 1959. Adults (age 19-64 years) accounted for 27% of these cases. The increase in reported cases of pertussis might be due to a real increase in the disease rate or to increasing availability and use of testing technology to confirm cases and increasing healthcare provider awareness and reporting of pertussis.

#### **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. Unfortunately, it is difficult to verify pertussis infection with existing laboratory methods.

If someone has a recent culture-documented case of pertussis, he or she may not need immediate immunization against pertussis; however, a vaccine containing pertussis antigen will not be harmful, and they should continue on the routine immunization schedule for future protection against tetanus, diphtheria, and pertussis. If culture is lacking, even with a history of pertussis, do NOT

withhold a dose of pertussis vaccine, if it is recommended per the routine schedule.

#### **When did pertussis vaccine become available?**

The first whole-cell pertussis vaccine was developed in the 1930s and was in widespread use by the mid-1940s, when pertussis vaccine was combined with diphtheria toxoid and tetanus toxoid to make the combination DTP vaccine.

In 1991, DTaP vaccine was licensed in the United States. The pertussis component of this vaccine is a more purified “acellular” version, which produces fewer side effects.

In 2005, two new tetanus toxoid-diphtheria-acellular pertussis (Tdap) vaccines were licensed. These vaccines are the first acellular pertussis-containing vaccines that make it possible to vaccinate adolescents and adults against pertussis.

Pertussis is not available as a single vaccine.

#### **What kind of vaccine is it?**

DTaP and Tdap vaccines are “inactivated” vaccines. Inactivated vaccines do not contain live bacteria or virus and cannot reproduce, which is why multiple doses are needed to produce immunity.

For the pertussis component of DTaP and Tdap vaccines, purified components of the bacterium are grown and then inactivated. DTaP is for children younger than 7 years and has a higher concentration of pertussis than Tdap, which is intended for persons 10 years and older.

#### **How is this vaccine given?**

The DTaP and Tdap vaccines are given as a shot in the muscle.

#### **Is there more than one brand of pertussis vaccine?**

At the present time, there are three different brands of DTaP (pediatric) vaccines available in the U.S. All three vaccines are equally effective and safe, and are given on the same schedule (two, four, six, 15-18 months, 4-6 years). DTaP is also part of two combination vaccines. Two companies produce the Tdap vaccines. The vaccines are approved for use in different age groups (10-18 years and 11-64 years).

It is preferable but not mandatory to use the same DTaP product for all doses.

#### **Who should get this vaccine?**

All infants should receive DTaP vaccine as part of their routine immunization unless they have a medical reason not to. Persons 10 years and older can

receive Tdap vaccine in place of a routine booster dose of adult Td vaccine.

#### **How many doses of DTaP vaccine are required?**

The usual schedule for infants is a series of four doses given at two, four, six, and 15-18 months of age. A fifth shot, or booster dose, is recommended at 4-6 years of age, unless the fourth dose was given late (after the fourth birthday). Both Tdap vaccines are approved for a single booster dose in their respective age groups, generally as a substitute for one dose of adult formulation tetanus and diphtheria toxoid.

#### **My father never received immunization against pertussis as a child. Should he get immunized as an adult?**

Adults or children ages seven years and older without documentation of tetanus and diphtheria vaccination should receive a primary series of three doses of tetanus-diphtheria toxoid (Td). The first two doses should be separated by 4-8 weeks, and the third dose given 6-12 months after the second dose. Td will protect you from diphtheria infection as well as tetanus. Tdap vaccine can be substituted for one of these three doses, preferably the first dose for persons 10 years and older to provide protection against pertussis.

#### **Who recommends this vaccine?**

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

#### **How safe is this vaccine?**

Most children have no serious reactions from this combined vaccine. The most common reactions are local reactions at the injection site, such as soreness, redness, and swelling, especially after the fourth or fifth dose. Other possible reactions may include fussiness, mild fever, loss of appetite, tiredness, and vomiting. The use of the more purified DTaP instead of the whole cell DTP has decreased these mild reactions substantially. Tdap is a new vaccine but trials have shown it to be safe.

#### **What side effects have been reported with this vaccine?**

Side effects such as crying for three or more hours (up to about one child out of 1,000 vaccinated) and high fever (about one child in 16,000) were known to have occurred following the whole cell pertussis vaccine in DTP. Now that the acellular pertussis vac-

cine (DTaP) is used exclusively in the U.S., these types of side effects are seen more rarely (estimated at about 1 in 10,000 doses). More serious reactions, such as seizures, are so rare that it is hard to tell if they are caused by the vaccine. If a child has a medical reason not to receive the pertussis vaccine, they can and should still be vaccinated against just diphtheria and tetanus with DT-pediatric vaccine.

The most frequently reported side effects following vaccination with Tdap were headache, generalized body aches, and tiredness.

#### **How effective is this vaccine?**

In general, inactivated vaccines are not as effective in producing immunity as are live vaccines. In studies of acellular pertussis vaccine, children who received three or four doses were 80%-85% less likely to develop pertussis than unvaccinated children. Immunity appears to last for five to 10 years. Tdap vaccine is believed to be similar in effectiveness and duration of immunity as pediatric DTaP vaccines.

#### **Who should NOT receive pertussis vaccine?**

People who had a serious allergic reaction to a previous dose of DTaP or Tdap vaccine, or who developed encephalopathy (brain injury) not due to another identifiable cause, 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, collapse or shock-like state, persistent crying for more than three hours, 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.

Persons with a moderate or severe illness should postpone receiving the vaccine until they are well.

#### **Can the vaccine cause pertussis?**

No.