

*Outbreaks of pertussis (whooping cough) have sickened thousands and led to the deaths of several infants less than 3 months of age over the last few years in the United States. Although outbreaks of pertussis typically occur every three to five years in the United States, the recent outbreaks have brought attention to two important points — immunity to pertussis is not life-long, and pockets of unimmunized people in a community make controlling outbreaks extremely difficult.*

## Q. What is pertussis?

**A. Pertussis, or whooping cough, is caused by a bacterial infection.** The disease occurs in three stages. The first stage appears similar to the common cold, with runny nose, sneezing, low-grade fever and coughing. After a week or two, illness progresses to the second stage where coughs worsen, often ending with a big intake of air or a “whoop.” The fits of coughing can be so violent that blood vessels can rupture and ribs can break. Infants, whose windpipes are narrower than those of older children, often turn blue during coughing spells because of lack of oxygen. This stage can last up to two months. During the final stage, which also often lasts for weeks or months, coughing spells will gradually decrease in frequency and intensity. Pertussis used to be called the “100-day cough” because of how long the cough lasted.

## Q. Is there a vaccine to prevent pertussis?

**A. Yes.** The history of pertussis vaccines in the United States is long and complicated.

In the 1920s, vaccines to protect against diphtheria, pertussis and tetanus became available. In the 1940s, these three vaccines were combined into a single shot (called DTP).

The pertussis component of the DTP vaccine was made by killing whole pertussis bacteria with the chemical formaldehyde. The pertussis part of DTP was called “whole-cell” pertussis because whole bacteria were used to make it. The vaccine was given to young children and dramatically reduced the incidence of hospitalizations and deaths caused by pertussis. However, the vaccine also rarely caused side effects that could be severe, such as seizures, high fever and persistent crying.

In the 1990s, a safer pertussis vaccine became available. This vaccine was made by purifying several pertussis proteins and inactivating them with formaldehyde. Because this new pertussis vaccine was purer and didn't contain whole bacteria, it was called the acellular pertussis vaccine (or aP). This new pertussis vaccine was combined with the diphtheria and tetanus vaccines in a combination called DTaP. The new DTaP vaccine caused fewer and less frequent side effects, so it replaced DTP and was recommended for all young children. Unfortunately, the DTaP vaccine couldn't be used in teenagers and adults because side effects from the vaccine (such as

fever, headache, fatigue, and pain and swelling at the site of injection) were common in anyone 7 years of age or older.

Fortunately, researchers found that by reducing the quantities of diphtheria and pertussis proteins contained in the DTaP vaccine, teenagers and adults didn't experience the high rate of side effects. This newer version for teens and adults, called “Tdap,” reflects the fact that it contains lower quantities of diphtheria (hence the lowercase “d”) and pertussis proteins (hence the lowercase “p”) as compared with the childhood version, known as DTaP.

## Q. Who should get DTaP?

**A. DTaP is the version of diphtheria, tetanus and pertussis vaccines used for infants and young children.** The first three doses, typically given at 2 months, 4 months and 6 months of age, will protect most infants from these diseases. Unfortunately, infants who have not received all three doses are among the most vulnerable to pertussis infections. An additional dose at 15 to 18 months and another at 4 to 6 years are given as boosters.

## Q. Who should get Tdap?

**A. Tdap is recommended for all adolescents beginning at 11 or 12 years of age.**

Adults, including those 65 years and older, should receive a single dose of Tdap to replace their next tetanus booster. Because healthcare workers are at increased risk of contracting pertussis, they should get the vaccine as soon as possible. Likewise, people who will be in contact with infants younger than 12 months of age should get the vaccine at least two weeks before coming into contact with the baby. Pregnant women should get the vaccine between 27 and 36 weeks gestation during *each* pregnancy. Any woman who does not get the vaccine during pregnancy should get it before going home.

By giving Tdap vaccine to pregnant women during the late second trimester or third trimester, antibodies generated by the mother can be transferred to the baby before birth most efficiently. Because babies less than 2 months of age are most likely to die from pertussis — an age before they would have received the first few doses of vaccine — this strategy of immunizing pregnant women is most likely to protect babies from dying from pertussis.

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# Pertussis: What you should know

## Q. Are the DTaP and Tdap vaccines safe?

A. Yes. About one of every three babies and young children will have pain, redness or swelling at the injection site, mostly after the doses around 1 and 5 years of age, and a small number will develop a fever following the DTaP vaccine. For those who get the Tdap vaccine, about half will experience pain or swelling at the site of injection, and a small number will develop headaches and fatigue.

Although about one of every 10,000 children who get the DTaP vaccine will experience a frightening reaction such as uncontrollable crying, high fever or seizure, none will be permanently harmed. However, a child who has a severe reaction to the vaccine should not get additional doses.

## Q. Do DTaP and Tdap prevent pertussis?

A. Yes. In medical studies, both DTaP and Tdap have been shown to protect about 80 to 85 of every 100 people who receive them. However, data from recent outbreaks have indicated that immunity wanes, so children become increasingly susceptible between the kindergarten and adolescent doses. These data have emerged following the change from the whole cell to the acellular pertussis vaccine in the mid-1990s. We now know that the price paid for increased safety was decreased protection. However, until a better pertussis vaccine is developed, the current vaccine affords the best opportunity for protecting ourselves and our families from pertussis, so continued use is important.



To address waning immunity, the CDC may recommend additional booster doses in the future.

## Q. Can people get the Tdap vaccine if they recently had the Td vaccine?

A. Yes. A vaccine to prevent tetanus and diphtheria, called Td, is also available for teenagers and adults. Many people have already gotten this vaccine. Because Td doesn't protect against pertussis, Tdap is still recommended regardless of when Td was given.

## Q. Can Tdap be given at the same time as other vaccines?

A. Yes.

## Q. Why is pertussis more serious in babies?

A. Because an infant's windpipe is much smaller than that of older children and adults, babies are much more likely to die from pertussis. Babies typically catch the disease from teenagers and adults living in the same home.

Approximately 15 to 20 babies in the United States die every year from pertussis. Almost all are younger than 4 months of age — too early to have been fully protected by the DTaP vaccine.

Because young babies get sick from pertussis and because they are not fully protected until they have had several doses of the DTaP vaccine, healthcare providers recommend that older children and adults who will be around newborns be protected; this is known as cocooning.

Teens and adults who will be around young infants should get a dose of the Tdap vaccine in anticipation of the baby's arrival.

Mothers should request the Tdap vaccine between 27 and 36 weeks gestation during *each pregnancy* or before leaving the hospital if they did not receive Tdap during pregnancy.

This information is provided by the Vaccine Education Center at The Children's Hospital of Philadelphia. The Center is an educational resource for parents and healthcare professionals and is composed of scientists, physicians, mothers and fathers who are devoted to the study and prevention of infectious diseases. The Vaccine Education Center is funded by endowed chairs from The Children's Hospital of Philadelphia. The Center does not receive support from pharmaceutical companies.

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