Diphtheria: Questions and Answers

INFORMATION ABOUT THE DISEASE AND VACCINES

What causes diphtheria?

Diphtheria is caused by a bacterium, *Corynebacterium diphtheriae*. The actual disease is caused when the bacteria release a toxin, or poison, into a person's body.

How does diphtheria spread?

Diphtheria bacteria live in the mouth, throat, and nose of an infected person and can be passed to others by coughing or sneezing. Occasionally, transmission occurs from skin sores or through articles soiled with oozing from sores of infected people.

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

The incubation period is short: 2–5 days, with a range of 1–10 days.

What are the symptoms of diphtheria?

Early symptoms of diphtheria may mimic a cold with a sore throat, mild fever, and chills. Usually, the disease causes a thick coating at the back of the throat, which can make it difficult to breathe or swallow. Other body sites besides the throat can also be affected, including the nose, larynx, eye, and skin.

How serious is diphtheria?

Diphtheria is a serious disease: 5%–10% of all people with diphtheria die. Up to 20% of cases lead to death in certain age groups of people (e.g., children younger than age 5 years and adults older than age 40 years).

What are possible complications from diphtheria?

Most complications of diphtheria are due to the release of the toxin, or poison. The most common complications are inflammation of the heart leading to abnormal heart rhythms and swelling of the nerves which may cause temporary paralysis of some muscles. If the paralysis affects the diaphragm (the major muscle for breathing), the patient may develop pneumonia or respiratory failure. The thick membrane coating at the back of the throat may cause serious breathing problems, including suffocation.

How do I know if someone has diphtheria?

The diagnosis of diphtheria can only be confirmed after a physician takes a small sample of infected material from the patient's throat (or other site) and has the sample tested in a laboratory. Because this disease progresses quickly, treatment usually should begin based on the health professional's assessment of the patient.

Is there a treatment for diphtheria?

Diphtheria is treated with both antibiotics and with diphtheria antitoxin. Diphtheria antitoxin was first used in the United States in 1891. Antitoxin does not get rid of toxin that is already attached to the body's tissues, but will neutralize any circulating toxin and will prevent

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the disease from getting worse. The patient should be tested for sensitivity to this antitoxin before it is given.

How common is diphtheria in the United States?

Diphtheria was once a greatly feared illness in the United States. In the 1920s, there were between 100,000 and 200,000 cases of diphtheria each year with 13,000–15,000 deaths. Because of widespread immunization and better living conditions, diphtheria is now rare in the United States (during 2004–2020, state health departments reported 6 cases of diphtheria in the United States).

Recent surveys have found that immunity from childhood vaccination wanes with age, and only 30% of U.S. adults age 60–69 years are immune to diphtheria. This is a concern because the disease continues to occur in other parts of the world. Outbreaks in other countries also increase the risk of diphtheria importation into the United States.

Can you get diphtheria more than once?

Yes. Even individuals recovering from diphtheria should be immunized against the disease as soon as possible.

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 diphtheria, tetanus, pertussis (DTP) vaccine. In 1991, concerns about DTP safety and side effects 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 vaccine products were licensed for adolescents and adults that combine the tetanus and diphtheria toxoids with acellular pertussis (Tdap) vaccine.

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 able to produce an immune response in the vaccinated person. They are known as “inactivated” vaccines because they do not contain live bacteria.

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, several childhood combination vaccines include DTaP as a component.
- **Tdap:** Tetanus and diphtheria toxoids with acellular pertussis vaccine; given to adolescents and adults. The CDC recommends that pregnant people should receive Tdap during each pregnancy.

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- **Td:** Tetanus and diphtheria toxoids; licensed for ages 7 years and older. The small “d” indicates a smaller quantity of diphtheria toxoid than in the pediatric DTaP formulation. CDC recommends use of Td in children younger than age 7 years who have developed a contraindication to pertussis vaccination.

How are these vaccines given?

The DTaP preparations (or Td when the pertussis component is contraindicated) are given as an injection in the anterolateral (toward the front but not in the exact middle) of the thigh muscle (for infants and young toddlers) or in the deltoid muscle (for older children). 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, adolescents, and 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 tetanus-toxoid containing vaccine should be given with 1 to 2 months between dose #1 and #2, and 6 to 12 months between dose #2 and #3. At least one of the doses, preferably the first, should be Tdap, with either Td or Tdap used for doses #2 and #3.

Because immunity to diphtheria and tetanus wanes with time, boosters of Td or Tdap 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 a 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 7–9 years did not complete a primary series in childhood, a dose of Tdap should be given as part of the catch-up schedule, followed by the routine adolescent dose at age 11–12 years. If the catch-up dose is given at age 10, it can be counted as the adolescent dose.

All adults should receive a single dose of Tdap as soon as feasible. Then, subsequent booster doses of Td or Tdap should be given every ten years. The CDC recommends that pregnant people 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 of either Td or Tdap may be given if the last dose was more than five years ago. If both Td and Tdap are available and the person has not received a dose of Tdap since their 7th birthday, give Tdap. It is important to keep an up-to-date record of all immunizations so that repeat doses don’t become necessary. Although it

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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 supports the use of these vaccines?

The use of these vaccines has been recommended by the Advisory Committee on Immunization Practices and approved by the CDC, American Academy of Pediatrics, American Academy of Family Physicians, American College of Obstetricians and Gynecologists, American College of Nurse-Midwives, American Academy of Physician Associates, American College of Physicians, National Association of Pediatric Nurse Practitioners, American Pharmacists Association, and the Society for Healthcare Epidemiology of America.

What side effects have been reported with these vaccines?

Local reactions, such as redness and swelling at the injection site, soreness and tenderness where the shot was given, as well as mild systemic reactions such as fever, are not uncommon in children and adults.

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 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 Td or Tdap are recommended every 10 years.

Short-term protection from pertussis illness after vaccination is about 80–85% but protection begins to decline after about a year.

Can a pregnant person receive Tdap vaccine?

Yes. The CDC recommends that all pregnant people should receive Tdap during each pregnancy, preferably early in the time period between 27 and 36 weeks' gestation. Studies show that vaccination during pregnancy reduces a baby's risk of getting pertussis in early infancy by 90 percent. Infants are not adequately protected against pertussis until they have received at least 3 doses of DTaP. If a new mother hasn't ever been vaccinated with Tdap, it should be administered before hospital discharge.

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.

A person younger than 7 years who develops encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures) not due to another identifiable cause within 7 days of administration of a previous dose of DTP or DTaP should not receive another dose of DTaP. To complete timely tetanus and diphtheria vaccination of these young children, CDC recommends off-label use of Td (tetanus-reduced diphtheria) vaccine (licensed for age 7 years and

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older), following the same schedule that would be used for DTaP in this age group. If the person whose encephalopathy followed a previous dose of DTP, DTaP, or Tdap, is currently age 7 or older, they should receive Td instead of Tdap.

Certain conditions are precautions to DTaP and Tdap vaccines. A precaution means that a person would usually not receive the vaccine but there may be occasions when the benefit of immunization outweighs the risk, for instance during a community-wide outbreak of pertussis.

Precautions include: Guillain-Barré syndrome (a rare type of neurological condition) within 6 weeks after a previous dose of tetanus toxoid; a severe local reaction (called an Arthus reaction) after a previous dose of tetanus or diphtheria toxoid-containing vaccine (defer vaccination until at least 10 years have elapsed since the last dose of vaccine that caused the reaction); and a moderate or severe acute illness with or without fever. A person with a mild illness may be vaccinated.

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.

Can the vaccine cause the disease?

No.

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