

# Tetanus: Questions and Answers

## INFORMATION ABOUT THE DISEASE AND VACCINES

### What causes tetanus?

Tetanus is caused by a toxin (poison) produced by the bacterium *Clostridium tetani*. The *C. tetani* bacteria cannot grow in the presence of oxygen. They produce spores that are very difficult to kill as they are resistant to heat and many chemical agents.

### How does tetanus spread?

*C. tetani* spores can be found in the soil and in the intestines and feces of many household and farm animals and humans. The bacteria usually enter the human body through a puncture (in the presence of anaerobic [low oxygen] conditions, the spores will germinate).

Tetanus is not spread from person to person.

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

The incubation period varies from 3–21 days, with an average of eight days. The further the injury site is from the central nervous system, the longer the incubation period. The shorter the incubation period, the higher the risk of death.

### What are the symptoms of tetanus?

The symptoms of tetanus are caused by the tetanus toxin acting on the central nervous system. In the most common form of tetanus, the first sign is spasm of the jaw muscles, followed by stiffness of the neck, difficulty in swallowing, and stiffness of the abdominal muscles.

Other signs include fever, sweating, elevated blood pressure, and rapid heart rate. Spasms often occur, which may last for several minutes and continue for 3–4 weeks. Complete recovery, if it occurs, may take months.

### How serious is tetanus?

Tetanus has a high fatality rate. In recent years, tetanus has been fatal in about 10% to 20% of reported cases.

### What are possible complications from tetanus?

Laryngospasm (spasm of the vocal cords) is a com-

plication that can lead to interference with breathing. Patients can also break their spine or long bones from convulsions. Other possible complications include hypertension, abnormal heart rhythm, and secondary infections, which are common because of prolonged hospital stays.

Obviously, the high probability of death is a major complication.

### How is tetanus diagnosed?

The diagnosis of tetanus is based on the clinical signs and symptoms only. Laboratory diagnosis is not useful as the *C. tetani* bacteria usually cannot be recovered from the wound of an individual who has tetanus, and conversely, can be isolated from the skin of an individual who does not have tetanus.

### What kind of injuries might allow tetanus to enter the body?

Tetanus bacilli live in the soil, so the most dangerous kind of injury involves possible contamination with dirt, animal feces, and manure. Although we have traditionally worried about deep puncture wounds, in reality many types of injuries can allow tetanus bacilli to enter the body. In recent years, a higher proportion of cases had minor wounds than had major ones, probably because severe wounds were more likely to be properly managed. People can also get tetanus from splinters, self-piercing, and self-tattooing. Injecting drug users are also at risk for tetanus.

### I stepped on a nail in our yard. What should I do?

Any wound that may involve contamination with tetanus bacilli should be attended to as soon as possible. Treatment depends on your vaccination status and the nature of the wound. In all cases, the wound should be thoroughly cleaned. Seek medical treatment immediately and bring your immunization record with you.

With wounds that involve the possibility of tetanus contamination, a patient with an unknown or incomplete history of tetanus vaccination needs a tetanus- and diphtheria-containing shot (Td or Tdap) and a dose of tetanus immune globulin (TIG) as soon as possible.

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A person with a documented series of three tetanus- and diphtheria-containing shots (Td or Tdap) who has received a booster dose within the last ten years should be protected. However, to ensure adequate protection, a booster dose of vaccine may still be given if it has been more than five years since the last dose and the wound is other than clean and minor.

### **Is there a treatment for tetanus?**

There is no "cure" for tetanus once a person develops symptoms, just supportive treatment and management of complications. The best "treatment" is prevention through immunization.

### **How common is tetanus in the United States?**

Tetanus first became a reportable disease in the late 1940s. At that time, there were 500–600 cases reported per year. After the introduction of the tetanus vaccine in the mid-1940s, reported cases of tetanus dropped steadily.

From 2016 through 2018, an average of 30 cases were reported per year.

Almost all cases of tetanus are in people who have never been vaccinated, or who completed their childhood series, but did not have a booster dose in the preceding 10 years.

### **What is neonatal tetanus?**

Neonatal tetanus is a form of tetanus that occurs in newborn infants, most often through the use of an unsterile cutting instrument on the unhealed umbilical stump. These babies usually have no temporary immunity passed on from their mother because their mother usually hasn't been vaccinated and therefore has no immunity.

Neonatal tetanus is very rare in the United States (only 3 cases were reported from 2001 through 2016), but is common in some developing countries.

### **Can you get tetanus more than once?**

Yes! Tetanus disease does not result in immunity because so little of the potent toxin is required to cause the disease. People recovering from tetanus should begin or complete the vaccination series.

### **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, four 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.

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- Tdap: Tetanus and diphtheria toxoids with acellular pertussis vaccine; given to adolescents and adults. Pregnant women 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 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 count 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. 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 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 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 Advisory Committee on Immunization Practices (ACIP), 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 redness and swelling at the injection site, and 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 the high levels of tetanus antibody in their blood.

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**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 tetanus and diphtheria toxoids are recommended every 10 years. Estimates of acellular pertussis vaccine efficacy range from 80% to 85%, but protection declines as the time since the dose increases.

**Can a pregnant woman receive Tdap vaccine?**

Yes. All pregnant women should receive Tdap during each pregnancy, preferably early in the time period between 27 and 36 weeks' gestation. Recent studies show that vaccination during pregnancy reduces a baby's risk of getting pertussis in early infancy by 90 percent. Because infants are not adequately protected against pertussis until they have received at least 3 doses of DTaP, it is important that all contacts (family members, caregivers) of infants younger than age 12 months are vaccinated with Tdap if they haven't previously received 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.

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. DT should be administered for the remaining doses in the series to ensure protection against diphtheria and tetanus. If the person is age 7 or older (including adults) whose encephalopathy followed a previous dose of DTP, DTaP, or Tdap, 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.