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# 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% of reported cases.

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

Laryngospasm (spasm of the vocal cords) is a complication 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 cleaned. Seek 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.

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 2000 through 2007 an average of 31 cases were reported per year. An all-time low of 20 cases were reported in 2003.

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 two cases have been reported since 1989), but is common in some developing countries. It caused more than 257,000 deaths worldwide each year in the years 2000 to 2003.

#### **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.
- Tdap: Tetanus and diphtheria toxoids with acellular pertussis vaccine; given as a one-time dose to adolescents and adults.
- 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 this vaccine?**

All people need protection against these three diseases—diphtheria, tetanus, and pertussis. Routine booster doses are also needed throughout life. Older children and adults without documentation of ever receiving the basic series of shots should receive a primary series of three doses, properly spaced. A single dose of Tdap is recommended for people ages 11 through 64 years in place of one of the Td doses, preferably the next one needed.

In October 2010, ACIP voted to recommend a one-time dose of Tdap for the following groups if they had not previously received a dose:

- Adults age 65 years and older who anticipate having close contact with an infant younger than age 12 months (e.g., grandparents, childcare providers, healthcare providers)
- Children ages 7 through 10 years who had not completed a full primary series of DTaP

They also recommended that other unvaccinated older adults (65 years or older) who did not anticipate having contact with an infant but wanted to be vaccinated with Tdap could be given a one-time dose.

**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. For people younger than age 65 years, one of the doses, preferably the first, should also contain the pertussis component in the form of Tdap. Adults ages 65 years and older may also get Tdap (see answer to preceding question).

Because immunity to diphtheria and tetanus wanes with time, boosters of Td are needed every ten years. Older children and adults who haven't received a pertussis-containing vaccine between the ages of 10 through 64 years should substitute a one-time dose of Tdap (with acellular pertussis) for one of the booster doses of Td.

**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 im-

munization 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 one-time dose of Tdap may be given earlier as part of the catch-up vaccinations.

All adults younger than age 65 years should receive a one-time dose of Tdap as soon as feasible. Then, subsequent booster doses of Td should be given every ten years. 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 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 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 the vaccine cause the disease?**

No.

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

Tdap is not contraindicated during pregnancy. It should be given to a pregnant woman who is in contact with an infant younger than age 12 months, is in a community experiencing a pertussis outbreak, or is a healthcare provider who sees children. A discussion of the risks and benefits of pertussis vaccine in pregnancy should occur between provider and patient. If there is no risk to the pregnant woman of acquiring or transmitting pertussis during pregnancy, the CDC's Advisory Committee on Immunization Practices recommends that Tdap vaccination be deferred until the immediate postpartum period. The new mother should receive Tdap 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, 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.