



by Evelyn Zamula

Adults Need Tetanus Shots, Too

Kathleen Bedford had her 15 minutes of fame in a hospital lecture room full of medical students when she was 65. Because there are only about two cases of tetanus a year in the eastern part of England where she lives, the hospital held a special session for the students. For most of them, it was their first--and maybe their last--opportunity to observe someone with the infection. With her injured leg suspended in a protective frame, Bedford was the center of attention. She would have preferred celebrity in some other way.

Bedford pierced the calf of her leg with a pitchfork crusted with dirt in a freak gardening accident. She was rushed to the emergency room. Her leg was bandaged from ankle to thigh, but she received no further treatment.

When she returned to the emergency room 24 hours later, feeling quite ill, the leg was highly inflamed. After the surgeon on duty took one horrified look at her leg, he rushed her to the operating room and cut her calf open deeply across the puncture site to expose the wound to air. During the next six weeks, the wound had to remain open; hence the frame. Bedford recalls she was treated with "all kinds of pills and shots" and escaped any secondary infection, such as pneumonia.

She experienced only one tetanus symptom--transitory stiffness. But the disease could have been avoided had she been properly immunized. Like many other older adults, Bedford had neglected to keep up her immunity to tetanus with periodic booster doses of tetanus vaccine.

'Lockjaw' Symptoms

Tetanus is an acute, often fatal disease that occurs worldwide. It affects the central nervous system, producing both the stiffness or muscular rigidity that Bedford experienced and convulsive muscle spasm. Tetanus can be localized, with muscle contractions in the part of the body where the infection began, or it can be generalized, affecting the whole body. About 80 percent of reported tetanus cases are generalized. The incubation period ranges from 2 to 50 days, but symptoms usually occur 5 to 10 days after infection. The shorter the incubation period, the greater the chance of death.

The most frequent symptom is a stiff jaw, caused by spasm of the muscle that closes the mouth--accounting for the disease's familiar name "lockjaw." Muscle stiffness all over the body may follow. An infected person may also have other symptoms: difficulty swallowing, restlessness and irritability, stiff neck, arms or legs, fever, headache, and sore throat. As the disease progresses, the victim may develop a fixed smile and raised eyebrows due to facial muscle spasms. Spasms of the diaphragm and the

muscles between the ribs may interfere with breathing, often requiring mechanical ventilation. The abdominal or back muscles may become rigid. In severe cases, patients may become so sensitive to any kind of disturbance that they suffer painful spasms all over their bodies with profuse sweating if the bed is jarred or if they feel a draft or hear a noise. Convulsions can be severe enough to break bones.

Hyperactivity of the autonomic (involuntary) nervous system may raise blood pressure dangerously or cause heart arrhythmias (irregular beats). Although tetanus victims can usually think clearly when conscious, coma may follow repeated spasms. Aspiration pneumonia is a common late complication and is found in 50 to 70 percent of autopsied cases. The mortality rate is about 25 percent in the United States and 50 percent worldwide.

Bacterial Cause

The bacteria that cause tetanus belong to the Clostridium family, also responsible for some other serious diseases, such as botulism and the type of gangrene suffered in war wounds. Clostridia bacteria are what scientists call "obligate anaerobic"--that is, they thrive only in the absence of oxygen. They also form spores, reproductive cells with thick walls that enable them to withstand unfavorable environmental conditions. Spores are tough to kill and highly resistant to heat and the usual antiseptics that treat wounds.

Tetanus bacteria may enter the body through a puncture wound or scratch. In the presence of dead tissue, tetanus spores reproduce and manufacture a poison (exotoxin) that travels through the body and causes tetanus symptoms. Though tetanus bacteria are found everywhere in the environment--in soil, street dust, and in animal intestines and feces--natural immunity to the disease is rare. This is why immunization is so important.

Vaccination with tetanus toxoid (tetanus vaccine) causes the body to respond to an inactivated form of the tetanus toxin by developing antibodies to tetanus. Tetanus toxoid is virtually 100 percent effective in preventing tetanus. It is prepared by growing tetanus bacteria (*Clostridium tetani*) in a special medium, and then detoxifying the resulting tetanus toxin with formaldehyde. The Food and Drug Administration reviews the manufacturer's testing records for each lot of vaccine to ensure that the product is safe and effective for its intended use. FDA also sometimes tests random lots to ensure that the manufacturer's testing records are accurate.

Side effects of vaccination are few. As with the DTP shot received by children (to immunize against diphtheria, tetanus and pertussis), redness or formation of a small hard lump at the vaccination site are possible. Some individuals may have allergic reactions, such as hives, skin rash, or itching. More serious adverse reactions include the rare cases of anaphylaxis (an allergic reaction involving difficulty in breathing or swallowing and facial swelling that can be fatal) and possibly Guillain-Barré syndrome, a nerve inflammation. People who have had a severe reaction to the vaccine should not receive further doses. (See "[Adult Immunizations.](#)")

Beyond Rusty Nails

The connection between a wound caused by a rusty/dirty nail and the necessity for a tetanus shot is fixed so firmly in the public mind that even the television cartoon character Homer Simpson knew he had to get a tetanus shot after stepping on a nail.

But people don't realize that tetanus can be contracted in other ways. Any puncture wound, especially one that is deep, can be infected with tetanus. Some seamstresses have contracted tetanus from sewing needles. Animal scratches and bites, and other wounds contaminated by both human and animal feces and saliva, are potential breeding grounds for tetanus bacteria. Infection can develop in wounds in which the flesh is torn or burned, or in wounds resulting from projectiles, such as arrows, bullets or shrapnel, or in those caused by crushing or frostbite. The disease may follow trivial wounds caused by thorns or splinters, as well as highly contaminated wounds, if oxygen is unable to reach the injured tissues. Tetanus can also develop after surgery, dental infections, and abortion. Cephalic tetanus, a rare form of the disease, is associated with chronic ear infections, in which tetanus bacteria are present in the inner ear. Tetanus has also been reported in people with no known acute injury, chronic wound, or other medical condition.

In developing countries, tetanus is a major health problem. Childbirth may take place under insanitary conditions, causing infection in the uterus afterwards. Tetanus in newborns has emerged worldwide as the predominant form of tetanus, as the baby's umbilical stump is often sealed with mud or clay or other contaminated substances.

CDC's Morbidity and Mortality Weekly Report of May 6, 1994 (available in [pdf format](#)), discusses two cases of tetanus that occurred in Kansas in 1993--the first cases reported in that state since 1987--that show the importance of immunization.

The first case involved an 82-year-old man, hospitalized because of shortness of breath and weakness and difficulty chewing and swallowing. When doctors examined him, they found he had difficulty opening his jaw and noted an abrasion on his right elbow resulting from a fall two days earlier. He had never been vaccinated. Doctors administered both tetanus toxoid and tetanus immune globulin (TIG). (An injection of tetanus toxoid after the injury does not give immediate full immunity. TIG confers temporary immunity to those people who have low or no immunity to tetanus toxin by providing antitoxin directly to the body, ensuring that protective levels of antitoxin are reached quickly rather than waiting for the body's immune response.) In the next few weeks, his body was racked by spasms, followed by respiratory failure and pneumonia, which necessitated the use of a breathing machine. After treatment with antibiotics, diuretics, and neuromuscular blocking agents, he recovered and was discharged a few weeks later.

The second case involved a diabetic 57-year-old man who had stepped on a rusty nail and sought emergency treatment for tetanus that same day. Hospital personnel cleaned the wound and administered tetanus toxoid. Four days later, he returned to the emergency department complaining of severe pain in the foot, as well as chills, fever and vomiting. When he developed pain and a stiff neck, he was hospitalized immediately with a diagnosis of tetanus and received TIG. After a number of life-

threatening heart and lung problems, he died following an episode of cardiac arrest. His relatives reported that he had not been previously vaccinated with tetanus toxoid.

The surviving and the deceased tetanus victims each spent about a month in the hospital and ran up medical bills of about \$150,000 apiece. At that time, public health clients could have received a tetanus shot for \$3.30, while vaccination with a private physician would have cost just a few dollars more.

Tetanus has become a rare disease in the United States as well as in England, with only 36 reported U.S. cases in 1994, though there may be more unreported cases. The disease has become uncommon not because tetanus bacteria have been eliminated from the environment--they're still all around us--but because immunization has provided protection.

Since adults 50 years or older account for 70 percent of tetanus infections, mature people should make certain they have received boosters within the last 10 years. If they don't know whether they were immunized as children, the primary series of shots should be completed.

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Childhood Immunizations

Immunization should be postponed if a child has a high fever or a severe infection. However, a minor illness, such as a mild respiratory infection, is no reason to delay immunization. All infants and children 6 to 8 weeks of age and up to 7 years should receive tetanus toxoid as part of their DTP (diphtheria and tetanus toxoids and pertussis vaccine adsorbed) immunization schedule. Those children who cannot tolerate the pertussis vaccine because of adverse reactions should continue, nevertheless, to be immunized with diphtheria and tetanus toxoids for pediatric use, according to the DT immunization schedule.

The Public Health Service's Advisory Committee on Immunization Practices (ACIP) and the American Academy of Pediatrics recommend that children receive five tetanus immunizations by the age of 6:

- three doses of DTP in their first year of life, usually given at 2, 4 and 6 months
- a fourth dose in their second year of life, usually between 15 and 18 months of age
- a fifth dose just before school entry, from 4 to 6 years of age. All 50 states have adopted laws requiring children to receive at least three immunizations before they can be admitted to school.

A recent survey found that one-fifth of older children (10 to 16 years of age) do not have protective antibody levels to tetanus. "The new recommendation," says Roland W. Sutter, M.D., medical epidemiologist, U.S. Centers for Disease Control and Prevention, "is that children aged 11 to 13 also receive a sixth dose with Td [tetanus and diphtheria toxoids for adult use] because immunity levels can

fall. It's also a convenient time to check to see if they've received the second dose of measles vaccine and whether they've received hepatitis vaccine at this point."

Children older than 7 years should receive tetanus toxoid as part of the tetanus and diphtheria toxoids (Td) for adult use, both for the primary series and for booster doses every 10 years. ACIP recommends the use of combined diphtheria and tetanus toxoids (Td) rather than tetanus toxoid alone for boosters because adult cases of diphtheria continue to occur both in the United States and in other parts of the world.

--E.Z.

Adult Immunizations

Some individuals may be protected for life against tetanus after a properly administered primary series of vaccinations, but in most people antitoxin levels fall with time. Adults should receive booster doses every 10 years, along with diphtheria immunization. "We are now recommending an adult immunization visit at age 50 years," says Roland W. Sutter, M.D., medical epidemiologist, U.S. Centers for Disease Control and Prevention, "when people can check their records to see if they are actually up-to-date with vaccinations, particularly for Td. Quite a number of older persons haven't received the primary series. If they haven't been immunized, this visit serves as an opportunity to initiate the series."

When given to adults, the first two primary doses of Td are administered at least four weeks apart, and the third dose is administered 6 to 12 months after the second.

In some individuals, antibody levels may fall too low to provide protection before 10 years have passed. That's why people who sustain a deep or contaminated wound should receive a booster dose if it has been more than five years since the last dose.

Immunization is especially recommended for:

- adults, especially those 50 years and older, because most of the tetanus cases in recent years have occurred in this age group
- persons who are not sure whether they have received the initial series of tetanus shots or boosters
- travelers, especially to countries with hot, damp climates and soil rich in organic matter
- agricultural workers and others who work with dirt or manure
- persons whose jobs or recreational activities expose them to cuts and scrapes
- those who are recovering from tetanus, because having a case of tetanus does not confer lasting immunity, as is true for some other diseases

- injured persons who may require emergency tetanus treatment depending on their immunization status (primary immunization, boosters) and the type of wound received
- pregnant women who have not been immunized or may be inadequately immunized or who may deliver their infants in unhygienic circumstances. After immunization, antibodies to the disease are passed from the mother to the fetus through the placenta.

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